

**Executive Summary of a  
Final Report on  
Phase One of an Investigation of  
Peoples Gas Light and Coke Company's  
AMRP**

**IPB Reference Number 22032146  
ICC14GAS0002**

**Presented to:  
The Illinois Commerce Commission**



**Presented by:  
The Liberty Consulting Group**



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### **AMRP Program Background**

The accompanying report provides the results of an examination by The Liberty Consulting Group (“Liberty”) of the Accelerated Main Replacement Program (“AMRP”) that Peoples Gas Light and Coke Company (“Peoples Gas” or “Company”) began in 2011. A senior Liberty team having lengthy backgrounds in utility management (including natural gas system engineering, construction, operations, and safety analysis experience), complemented with customer service and regulatory management experience, completed this investigation.

### **Overall Conclusions**

From a positive perspective, the AMRP program has proven essentially functional in replacing high-risk, leak-prone cast iron and ductile iron pipe with new plastic pipe that should not leak. The AMRP has used a sound approach to physical configuration, reasonably-effective engineering and construction standards, experienced contractors selected through competitive solicitations, and materials well suited to providing leak risk reduction, pressure increase, and meter relocation. However, management of the AMRP beginning with the Integrys board of directors down to the field supervision level has not been effective enough to support program needs sufficiently.

Liberty’s year-long investigation disclosed a lack of management expression or understanding of: (a) likely overall program costs, (b) likely program duration relative to targeted completion of leak-prone pipe replacement by 2030, and (c) the reasons why leak rates have not fallen significantly after four years of accelerated replacement of cast iron and ductile iron mains. The fundamental drivers of overall AMRP success should have much greater attention. Liberty also found a need for major changes designed to optimize cost, schedule, and effectiveness. The Company needs to make these changes to raise management, control, and oversight to a level that Liberty considers reasonable for a program of the size, scope, and duration of the AMRP.

The significance, breadth, and immediacy of the improvements needed prompted Liberty to begin discussions with senior Integrys and Peoples Gas leadership in September 2014. Liberty’s January 2015 interim report provides the results of those discussions, which produced general agreement on improvement needs. Management described for Liberty, and has begun to implement, a series of initiatives designed to make AMRP changes. Those changes will require massive effort and in some cases more than a year to complete. Liberty’s accompanying final investigation report identifies a more extensive list of appropriate changes, and describes the reasons for making the changes (and those addressed in the interim report) necessary.

### **Getting a Handle on Program Drivers**

Combining leak-prone pipe replacement with pressure increase and meter relocation work promotes installation efficiency, but raises concerns about prioritizing pipe replacement work. Peoples Gas limits annual expenditures to amounts not exceeding what Rider QIP allows for accelerated rate recovery. It will take replacement of about 100 miles of pipe annually to meet the AMRP’s 2030 completion target. The actual rate from 2011 through 2014 has been significantly below that level. The Company’s lack of reliable installation targets and data on completed work preclude both Peoples Gas and Liberty from estimating resulting overall schedule slippage with a meaningful degree of accuracy. Liberty’s use of the limited data available indicates a loss of a year or so. Losing a year to schedule in only four years of operation makes it appropriate to question the Company’s current ability to complete high-risk pipe replacement by, or even close to, 2030.

The lack of sufficient information, however, precludes the ability for Liberty to offer a determination of the likely schedule and completion date for the AMRP.

The Company has much to do to improve its management systems to a level that supports a reliable schedule for AMRP completion. It should place a high priority on making that improvement.

Despite significant acceleration of gas main replacements (up from about 40 miles per year prior to the AMRP's 2011 inception), leak rates have not fallen materially in the last several years. Before adjustments for accidental hits and harsh weather, leak rates have actually increased. The Company uses a good method for identifying leaks and assessing resulting safety risks. However, the persistence of high leak rates makes it timely to reexamine the criteria (and the weight given to them) used to prioritize risk, and to decide what pipe to replace next. More importantly, adding pressure increase work and meter relocation work to leak-prone pipe replacement work can delay replacement of all but the very highest-risk gas mains, and extend the duration of the AMRP.

Coordination of AMRP work with City of Chicago street work also has potentially significant AMRP implications. There is no guarantee that the City's work plans, which Peoples Gas said will expand significantly in coming years, will coincide with high-priority pipe replacement needs. The Company adjusts AMRP replacement schedules to advance work to match City plans (thus avoiding, for example, a moratorium on utility street work following City repaving). A substantial increase in City work thus threatens to delay higher-risk gas main replacements further. The persistence of high leak rates makes these issues critical for Peoples Gas to address promptly.

The AMRP experienced unusually large cost growth across its short history to date. The 2009 estimate of \$2.63 billion grew to \$4.45 billion in a 2012 estimate. The Company has announced no estimate since. In addition to being out of date, this 2012 estimate includes no consideration of inflation or contingency to cover unforeseen costs. When the Company finally completes a credible estimate it should move substantially higher in cost. Liberty learned in mid-2014 that the Company did not believe it had the modeling capability to produce a credible total program estimate. More than six months later, the program remains without that new estimate. Liberty does not know when the new estimate will emerge. Liberty considers AMRP program costs very likely to experience a material increase from the 2012 estimate, when AMRP management provides a new one. The nature and quality of current information, however, preclude Liberty from offering a determination of likely annual and total AMRP costs.

Continued use of a flawed and significantly outdated cost estimate demonstrates a major gap in AMRP management. The inability even to prepare a credible estimate raises a fundamental concern about the quality of AMRP management, control, and oversight.

### **Management, Control, and Oversight Improvements**

Many AMRP management, control, and oversight weaknesses have contributed to current uncertainty about cost and schedule. Correcting these management failures will give opportunities for optimizing AMRP program efficiency and effectiveness. First, Peoples Gas must bring all AMRP management functions now located at Peoples Gas and at Integrys into one organization headed by one program manager. Second, Peoples Gas must assign sufficient numbers of dedicated, skilled resources to work solely on AMRP. The program should not continue to compete with non-AMRP work for resources. Third, the new organization requires a full-time program manager based in Chicago, where AMRP work occurs. Fourth, the program manager must staff the management team with internal resources that displace many of the currently used consultants.

The priorities of the new organization must include development of a long-term program management organization approach, matching required resources against current capabilities, finding ways to meet short- and long-term resource gaps, instilling a commitment to active and holistic cost management, and creating and effectively using skilled organizations and tools to prepare credible cost, schedule, and resource plans and estimates.

Liberty has also identified a number of opportunities for improving the efficiency, effectiveness, and safety of field work, and for strengthening engineering and construction standards. In particular, employee safety requires a dedicated, executive-led focus and Company commitment, as Liberty's work some five years ago for this Commission found.

Liberty particularly emphasizes the need for AMRP program and project reporting to improve in fundamental ways. The Company's data collection does not support a sharp and well-supported analysis of key program cost and schedule drivers. The existence of a suitable, well-informed analysis of those drivers comprises an essential element of best practice. It will take substantial skills additions, data collection, and reporting changes, and a commitment to continuous performance analysis to make this element an effective component of AMRP management, control, and oversight. Developing the required analytical capability should be a major priority.

Making the changes required will also lay the basis for improved senior executive and board of director oversight of the AMRP. The structure of executive oversight has been cumbersome, reporting has not highlighted the right information in the volumes of data presented, senior leadership has not received focused analysis of performance issues, and oversight has not produced a clear trail of problem identification, solution adoption, and follow-up.

Integrys and Peoples Gas have a great deal to accomplish to attain the "world class" status their senior leadership acknowledges as the appropriate one for AMRP management, control, and oversight. Prompt, full execution of the announced initiatives would make a strong, primary contribution. Still, meeting the full range of needs identified in Liberty's report will have to occur and be sustained to reach this status. The size and complexity of the required changes, especially in view of historical program difficulties, warrant retention of outside assistance to move the change processes forward expeditiously, while assuring more than nominal improvement.

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**May 5, 2015**

## *Table of Contents*

Part One: Overview and Report Summary .....	One-i
Chapter A: Investigation Background and Scope .....	A-1
Chapter B: Report Summary .....	B-1
1. The Peoples Gas Distribution System.....	B-1
2. AMRP Definition and Status .....	B-2
3. AMRP Management Plan .....	B-6
4. Risk Assessment and Replacement Prioritization.....	B-8
5. Cost Planning.....	B-9
6. Schedule Planning.....	B-10
7. Resource Planning .....	B-10
8. Scope Control.....	B-11
9. Cost Estimating.....	B-11
10. Cost Management .....	B-12
11. Procurement and Contracting .....	B-13
12. Executive Oversight.....	B-13
13. Reports and Analysis .....	B-14
14. Auditing .....	B-15
15. Field Work Performance.....	B-16
16. Work Management.....	B-17
17. Safety and Permit Compliance.....	B-17
18. Government Coordination .....	B-18
19. Customer Coordination.....	B-19
20. Liberty's January 2015 Interim Report.....	B-20
Chapter C Table of Contents.....	C-i
Chapter C: The Peoples Gas Distribution System .....	C-1
1. Background.....	C-1
2. Findings.....	C-1
3. Conclusions.....	C-11
4. Recommendations.....	C-15
Chapter C Appendix: Comparisons with Companies Having >500 Combined Miles of Cast and Ductile Iron Main .....	C-17
Chapter D Table of Contents .....	D-i

Chapter D: Definition and Current Status of the AMRP .....	D-1
1. Background .....	D-1
2. Findings.....	D-1
3. Conclusions.....	D-16
4. Recommendations.....	D-19
Chapter D Appendix: 20-Year Plan (Neighborhood Plan Range).....	D-21
Part Two: AMRP Planning .....	Two-i
Chapter E Table of Contents .....	E-i
Chapter E: The Plan for Management .....	E-1
1. Background .....	E-1
2. Findings.....	E-2
3. Conclusions.....	E-12
4. Recommendations.....	E-15
Chapter F Table of Contents .....	F-i
Chapter F: Risk Assessment and Replacement Prioritization.....	F-1
1. Background .....	F-1
2. Findings.....	F-3
3. Conclusions.....	F-13
4. Recommendations.....	F-22
Chapter G Table of Contents .....	G-i
Chapter G: Cost Planning .....	G-1
1. Background .....	G-1
2. Findings.....	G-1
3. Conclusions.....	G-6
4. Recommendations.....	G-7
Chapter H Table of Contents .....	H-i
Chapter H: Schedule Planning .....	H-1
1. Background .....	H-1
2. Findings.....	H-1
3. Conclusions.....	H-11
4. Recommendations.....	H-13
Chapter I Table of Contents .....	I-i
Chapter I: Resource Planning .....	I-1
1. Background .....	I-1

2.	Findings.....	I-1
3.	Conclusions.....	I-8
4.	Recommendations.....	I-11
Part Three: AMRP Management and Control .....		Three-i
Chapter J Table of Contents.....		J-i
Chapter J: Scope Control .....		J-1
1.	Background .....	J-1
2.	Findings.....	J-1
3.	Conclusions.....	J-3
4.	Recommendations.....	J-3
Chapter K Table of Contents .....		K-i
Chapter K: Cost Estimating .....		K-1
1.	Background .....	K-1
2.	Findings.....	K-2
3.	Conclusions.....	K-5
4.	Recommendations.....	K-7
Chapter L Table of Contents.....		L-i
Chapter L: Cost Management .....		L-1
1.	Background .....	L-1
2.	Findings.....	L-2
3.	Conclusions.....	L-10
4.	Recommendations.....	L-12
Chapter M Table of Contents.....		M-i
Chapter M: Procurement and Contracting .....		M-1
1.	Background .....	M-1
2.	Findings.....	M-1
3.	Conclusions.....	M-8
4.	Recommendations.....	M-10
Chapter N Table of Contents .....		N-i
Chapter N: Executive Oversight .....		N-1
1.	Background .....	N-1
2.	Findings.....	N-1
3.	Conclusions.....	N-12
4.	Recommendations.....	N-15



Chapter O Table of Contents .....	O-i
Chapter O: Reports and Analysis and Controls Skills .....	O-1
1. Background .....	O-1
2. Findings.....	O-1
3. Conclusions.....	O-5
4. Recommendations.....	O-6
Chapter P Table of Contents .....	P-i
Chapter P: Auditing of AMRP Costs.....	P-1
1. Background .....	P-1
2. Findings.....	P-1
3. Conclusions.....	P-4
4. Recommendations.....	P-6
Part Four: Managing Work in the Field.....	Four-i
Chapter Q Table of Contents .....	Q-i
Chapter Q: Field Work Performance .....	Q-1
1. Background .....	Q-1
2. Findings.....	Q-1
3. Conclusions.....	Q-7
4. Recommendations.....	Q-13
Chapter R Table of Contents.....	R-i
Chapter R: Work Management .....	R-1
1. Background .....	R-1
2. Findings.....	R-2
3. Conclusions.....	R-11
4. Recommendations.....	R-13
Chapter S Table of Contents .....	S-i
Chapter S: Safety and Compliance .....	S-1
1. Background .....	S-1
2. Findings.....	S-1
3. Conclusions.....	S-9
4. Recommendations.....	S-10
Chapter T Table of Contents.....	T-i
Chapter T: Governmental Coordination .....	T-1
1. Background .....	T-1

---

2.	Findings.....	T-1
3.	Conclusions.....	T-8
4.	Recommendations.....	T-13
Chapter U Table of Contents .....		U-i
Chapter U: Customer Coordination .....		U-1
1.	Background .....	U-1
2.	Findings.....	U-1
3.	Conclusions.....	U-4
4.	Recommendations.....	U-7
Part Five: Monitoring.....		Five-i
Chapter V Table of Contents .....		V-i
Chapter V: Monitoring.....		V-1
1.	Background .....	V-1
2.	Program Performance Monitoring Objectives and Guidelines.....	V-2
3.	Recommended Program Performance Monitoring Process Flow.....	V-4
4.	Report Content .....	V-5
5.	Recommendations.....	V-9
Chapter V Appendix: Program Performance Monitoring Guidelines .....		V-11
Report Appendix A: Investigation Review Area and Report Chapter Cross-Reference Table .....		App. A-1
Report Appendix B: List of Recommendations.....		App. B-1

### *List of Tables and Figures*

Figure C.1: Maintenance Activity by Main Vintage .....	C-2
Figure C.2: Utilities with >500 Miles of Cast and Ductile Iron Pipe .....	C-4
Figure C.3: Gas Services by Material .....	C-4
Figure C.4: Bell and Spigot Joint.....	C-5
Figure C.5: Pipe Breaks and Replacements .....	C-8
Figure C.6: Class 1 and 2 Leaks Normalized for Weather and Third-Party Damage .....	C-8
Figure C.7: Leak Backlogs .....	C-9
Figure C.8: Leaks Repaired (Actual and Linear).....	C-9
Figure C.9: Companies with the Highest Numbers of Contractor Damages .....	C-10
Figure C.10: Corrosion Leaks .....	C-14
Chart C.A.1: Unaccounted for Gas .....	C-18
Chart C.A.2: Bare Steel Services .....	C-19
Chart C.A.3: Ductile Iron Services .....	C-20
Chart C.A.4: Cast Iron Services.....	C-20
Chart C.A.5: Corrosion Leaks – Mains .....	C-21
Chart C.A.6: Material or Weld Failures – Mains.....	C-21
Table D.1: Miles of Cast and Ductile Iron Installed and Retired .....	D-4
Chart D.2: Cast and Ductile Iron Retirements History .....	D-7
Chart D.3: Installed Versus Retired Pipe Rates .....	D-8
Chart D.4: AMRP Main Installation and Retirement Miles .....	D-9
Chart D.5: AMRP Progress Measurement by Peoples Gas .....	D-10
Chart D.6: Corrected AMRP Performance Chart .....	D-10
Table D.7: AMRP Production Levels .....	D-11
Chart D.8: Installations Required to Support 100 Miles of Retirements (Hypothetical).....	D-11
Table D.9: Planned and Actual Service and Meter Installations .....	D-12
Table D.10: Annual Service and Meter Installations.....	D-12
Table D.11: Implied Service and Meter Installation Requirements (Scenario 1).....	D-13
Table D.12: Implied Service and Meter Installation Requirements (Scenario 2).....	D-13
Table D.13: AMRP Spending Summary .....	D-14
Table D.14: Meter Installation Productivity .....	D-15
Table D.15: Dollar-Measured AMRP Productivity .....	D-15
Illustration E.1: Plan Hierarchy .....	E-1

Chart E.2: Typical “Weak” (Matrix) Project Structure .....	E-7
Chart E.3: Strong Project Manager Structure .....	E-8
Figure E.4: Features Differentiating Project Approaches .....	E-8
Figure F.1: Main Leaks Received .....	F-5
Figure F.2: Main Leaks Repairs by Grade .....	F-6
Figure F.3: Main Ranking Index Algorithm .....	F-9
Table F.4: August 2014 MRI Model Result, Segments with Ranking >6 .....	F-10
Table F.5: Neighborhood Criteria Weights .....	F-10
Table F.6: Neighborhood Ranking Algorithm .....	F-10
Table F.7: Five-Year Replacement Plan Results .....	F-12
Table F.8: Evaluation of Main Segments Based on Main Ranking Index .....	F-14
Table F.9: Remaining Distribution System Cast Iron .....	F-17
Table F.10: Leak Count .....	F-17
Table F.11: Annual Number of Hazardous or Potentially-Hazardous Leaks .....	F-18
Table F.12: Type 1 and 2 Leak Count .....	F-18
Table F.13: Maintenance Repairs per Foot of Main .....	F-19
Table F.14: 2015 Major Neighborhood Replacement Projects .....	F-20
Table G.1: Proposed Main Replacement and Pressure Increase Quantities .....	G-1
Table G.2: Original Estimate Methods .....	G-2
Table G.3: Reconciliation of 2009 and Current (2012) AMRP Estimates .....	G-3
Table G.4: Unit Rate Changes from Original to Current Estimate .....	G-4
Table G.5: Handy Whitman Index Data .....	G-7
Illustration G.6: Cost Element Template Example .....	G-10
Illustration G.7: Depictions of Annual Monitoring Components .....	G-11
Illustration G.8: Depicting the Erosion of Program Reserve .....	G-12
Illustration H.1: Schedule Management Process .....	H-2
Figure H.2: 2015 Schedule of Active Projects .....	H-3
Illustration H.3: Sample Logic Model .....	H-7
Illustration H.4: Recently Adopted Contractor Performance Comparisons .....	H-8
Table H.5: Contractor Crew-Level Production Monitoring .....	H-8
Table H.6: Weekly Contractor Crew Count Reports .....	H-10
Table H.7: AMRP Reporting of Contractor Schedule Status .....	H-10
Chart I.1: AMRP Staffing Information Reported Monthly .....	I-3
Chart I.2: Monthly Report Sample – Main Installations .....	I-4

Chart I.3: Monthly Report Sample – Service Installations .....	I-5
Chart I.4: Monthly Report Sample – Main Installations.....	I-5
Table I.5: 20-Year AMRP Unit Cost Rates Assumed .....	I-6
Table I.6: Mechanic Qualification Training and Time Spans.....	I-7
Chart I.7: Annual AMRP Resource Allocations .....	I-10
Chart I.8: Cumulative AMRP Resource Allocations .....	I-11
Chart I.9: Installation Productivity Measures .....	I-13
Illustration K.1: The Cost Estimating Template .....	K-4
Chart L.1: Integrys Cost Management Flow Diagram.....	L-4
Chart L.2: AMRP Cost Management Office .....	L-5
Table L.3: Cost Tool Components.....	L-7
Illustration L.4: AMRP Monthly Report Cost Summary (December 2014) .....	L-8
Illustration L.5: AMRP Monthly Capital Spend Summary (December 2014) .....	L-8
Illustration L.6: AMRP Monthly Expenditure Tracking (December 2014) .....	L-9
Illustration L.7: Holistic Cost Management Approach Structure .....	L-13
Table M.1: 2013 and 2014 Instances of Materials Shortages .....	M-3
Table M.2: AMRP Change Orders by Year.....	M-7
Table N.1: Regular AMRP Updates Since 2011 .....	N-10
Figure N.2: Example of Integrys Board Scorecards .....	N-11
Table P.1: Scope of Material and Equipment Control Initiatives .....	P-2
Illustration R.1: AMRP Work Activity Flow .....	R-3
Table R.2: Summary of Major AMRP Project Work Activities.....	R-3
Illustration R.3: AMRP Work Management Tools.....	R-6
Table R.4: AMRP Support Group Functions.....	R-9
Illustration R.5: AMRP Permitting Work Flows .....	R-11
Table S.1: Pipeline Safety Notices and Inspection Issues .....	S-2
Table S.2: 2012 City of Chicago Permit Issues .....	S-4
Table S.3: 2013 City of Chicago Permitting Issues.....	S-5
Table S.4: OSHA Citations.....	S-6
Table T.1: Meetings with Chicago Department of Transportation.....	T-5
Figure T.2: AMRP vs. Total Permits from the City of Chicago.....	T-5
Table T.3: City of Chicago Permit Fees .....	T-6
Table T.4: Cost of Chicago Department of Transportation Permits .....	T-6
Table T.5: Illinois Permits .....	T-7



---

Table T.6: City Of Chicago Permits Issued .....	T-10
Table U.1: AMRP Complaints Received.....	U-3
Figure U.2: Unopened Construction Complaints (Awaiting Assignments) .....	U-6
Figure V.1: Proposed ICC Monitoring Process .....	V-4
Figure V.2: Cost Forecast “Snapshot” .....	V-6
Figure V.3: Erosion of Reserve .....	V-6

# Part One: Overview and Report Summary

## Chapter A: Investigation Background and Scope

The Liberty Consulting Group (“Liberty”) performed an approximately year-long investigation for the Illinois Commerce Commission of the planning and execution of the Accelerated Main Replacement Program (“AMRP”) being conducted by The Peoples Gas Light and Coke Company (“Peoples Gas” or “the Company”). Liberty conducted this investigation following selection by the Commission based on response to a detailed Request for Proposals. That request listed the following areas for review:

1. Peoples Gas’ understanding of its delivery infrastructure condition
2. Miles of gas main replaced to date under the program
3. Miles remaining to be replaced and required annually to meet a 20-year program duration
4. Gas mains and lengths intended for replacement each year
5. Determination of likely schedule required for program completion
6. Likely annual and total program costs
7. Development of a method for Commission monitoring of AMRP cost and progress
8. Appropriateness of program and project planning and scheduling
9. Program and project cost estimating methods and accuracy
10. Managing City permits and communication; material procurement
11. Program budgeting process and relationship to construction scheduling
12. Methods and factors considered in prioritizing replacements
13. Program and project management methods and practices
14. Facility engineering and design
15. Construction standards for new facilities installed
16. Construction methods, policies, and practices; right-of-way acquisition
17. Oversight of work quality and conformance to specifications
18. Conformance of work to plans, designs, and construction and materials standards
19. Use of subsurface investigation services and geophysical techniques
20. Procedures and practices for addressing unexpected field conditions
21. Methods for gaining access to indoor meters and cutting services over to new facilities
22. Quality and appropriateness of construction materials
23. Materials purchasing policies, procedures, and practices
24. Construction contract award policies, procedures, and practices
25. Contractor experience, qualifications, and training
26. Permit acquisition methods and timing
27. Relationship and communications with other public and business entities
28. Information and schedule sharing and plan coordination with the City of Chicago
29. City of Chicago issues regarding Peoples Gas and its work practices
30. Inspections of active AMRP construction sites
31. Violations and failures to follow government safety standards
32. Reasonableness, prudence, and used and useful nature of all aspects of Peoples Gas’ AMRP
33. Policies and practices for calculating reductions in operation and maintenance costs.

Liberty conducted its work according to performance evaluation criteria. This report provides the results of the investigation, sorted into the following overall structure, which encompasses the detailed list of items that the Request for Proposals listed for review:



**Part One: Overview and Report Summary**

- A. Investigation Background and Scope
- B. Report Summary
- C. The Peoples Gas Distribution System
- D. AMRP Definition and Status

**Part Two: AMRP Planning**

- E. Plan for Management
- F. Risk Assessment and Replacement Prioritization
- G. Cost Planning
- H. Schedule Planning
- I. Resource Planning

**Part Three: AMRP Management, Oversight, and Control**

- J. Scope Control
- K. Cost Estimating
- L. Cost Management
- M. Contracting and Procurement
- N. Top Level Direction and Oversight
- O. Reports and Analysis
- P. Auditing

**Part Four: Managing Work in the Field**

- Q. Field Work Performance
- R. Work Management
- S. Safety and Permit Compliance
- T. Government Coordination
- U. Customer Coordination

**Part Five: Monitoring**

- V. Monitoring

## Chapter B: Report Summary

### 1. The Peoples Gas Distribution System

The Peoples Gas system shares many characteristics in common with older, U.S. metropolitan systems that distribute natural gas. Most significant in the AMRP context are large numbers of cast and ductile iron mains, services also employing risk-prone materials, low-pressure operation, large numbers of meters located inside customer buildings, and significant difficulty and expense in gaining access to facilities located under city streets. The Peoples Gas system employs about 4,200 miles of main. Cast and ductile iron mains, some installed as far back as the 1800s, made up about 40 percent of that total at the end of 2013. These 1,648 miles constituted the country's fourth largest inventory of such pipe at that time. Low pressure systems, frequently a legacy of the industry's early days of locally manufactured gas, also present safety risks not found in more modern, medium pressure systems. Newer medium pressure systems also have capacity more appropriate to supporting system expansion and increasing customer applications for and use of natural gas.

Peoples Gas addresses cast and ductile iron replacement, system pressure increase, and the movement of meters from inside to outside customer buildings through a commonly managed program. The program focuses primarily on an approach that brings all three improvements simultaneously to those City of Chicago neighborhoods designated for work over the long course of the AMRP. The approach varies from the more traditional industry configuration of a single main down the middle of the street to serve customers on both sides. The Company's "double decking" method uses two mains (generally located in the "parkway" adjoining streets), each serving customers on its side of the street. Double decking imposes significant addition of materials, but avoids a significant portion of the substantial costs and restrictions imposed by the City on work involving street openings.

Liberty found that Peoples Gas has a sound knowledge of the numbers and locations of its problem mains and services. The high number of these facilities warrants a much accelerated method for accomplishing their replacement. The combined approach to managing work (pipe replacement, pressure increase, and meter relocation) is generally appropriate, subject to careful consideration of highest-risk facilities. Similarly, despite the added cost of double decking, it too reflects an appropriate method, given City requirements. Liberty's investigations also found, however, that the Company needs to address a number of issues associated with its massive, long-term program for system safety and operational improvements:

- The system suffers very large numbers of damaging incidents from third-parties working in proximity to gas facilities.
- Peoples Gas has areas (as do other large municipal suppliers) that experience pressure drops in extremely cold weather. These pressure drops impose service reliability risks. A large number (88) of those areas exist, according to Company analysis. The factors used to prioritize work should include the ability to sustain adequate operating pressure.
- Service valves provide important operating and safety risk mitigation devices. Good practice requires verification of their operability. Peoples Gas does not, but should routinely audit operability, and establish a metric that supports application of an operability target for these devices.

- Industry practice calls for testing medium-pressure mains and services at 100 psig. Such testing supports increase, for example, to 60 psig in the future. Peoples Gas tests only to 50 psig. This practice reduces flexibility to upgrade new installations to higher pressure in the future, where and as may be required.

## 2. AMRP Definition and Status

By any measure, the AMRP involves one of the country's largest utility construction programs of any type. Its scope includes the replacement of high-risk, leak-prone (the two terms are used interchangeably in this report) gas mains and services. They consist principally of cast-iron and ductile-iron pipe, generally of very old vintage. Peoples Gas has an unusually high amount of such old, high-risk pipe. The Illinois legislature authorized expedited recovery from customers of costs incurred for the replacement, pressure-increase, and meter relocation work. A Qualifying Infrastructure Plan Surcharge provides across a five-year term for the recovery of expenditures for these purposes.

Since AMRP inception in 2011, costs have been rising, work appears to have fallen behind the pace required to support 2030 completion, and leak rates have not fallen substantially, even though replacement of leak-prone pipe has accelerated.

The AMRP calls for the replacement of high-risk facilities across a 20-year duration, expecting to end in 2030. The massive quantities planned as part of leak-prone pipe replacement, pressure increase, and meter relocation include:

- Mains: 3,056 miles installed, 2,028 miles retired
- Services: 296,391
- Meters: 406,927
- Interstation High Pressure: 63 miles
- Pressure Regulator Stations: 325 abandoned, 51 new
- City Gate Station Additions: 2.

The current estimate of total program costs by Peoples Gas amounts to \$4.45 billion. It appears that this amount will soon grow substantially, as the Company completes current work on a total program re-estimate. Peoples Gas prepared the current, \$4.45 billion estimate in 2012. The Company has not provided another estimate since. Management acknowledged to Liberty in mid-2014 that it did not have (but was developing) the capability to prepare a new, credible total program estimate. The AMRP is too important and creates too much financial risk for Peoples Gas and its stakeholders to have continued without a credible estimate of cost for so long.

The lack of a sound estimate and a lack of cost detail in AMRP reporting make it impracticable for anyone, management included, to forecast total costs at present. Liberty therefore cannot provide a determination of likely AMRP costs. The data that is available, however, indicate significant cost exposure above the current \$4.45 billion estimate. Peoples Gas has cited changes in the requirements of Chicago's Department of Transportation with respect to work affecting City streets as a major source of unexpected costs, thus acknowledging, at least qualitatively, that costs have exceeded expectations.

Like cost, the schedule of the AMRP also faces significant uncertainty and risk. Peoples Gas has managed the AMRP to limit annual expenditures to the amount that qualifies for expedited recovery under the Qualifying Infrastructure Plan Surcharge. Extrapolating progress made and costs incurred to date would suggest an AMRP duration of longer than 20 years. Across its first four years of operation, replacement-rate data suggests a schedule loss already of perhaps a year or more. One can only roughly gauge schedule loss, given the significant gaps in the information that AMRP management reports. Management has observed, however, that uncertainty about expedited rate recovery (accompanied by a late start to the 2014 construction season due to harsh winter weather leading up to it) has caused progress to lag. The focus on limiting spending to the amounts that qualify annually for Qualifying Infrastructure Plan Surcharge recovery, the short duration set for such recovery, and the effect that recovery uncertainty has had in the past call into question the nature of the Company's commitment to a 20-year duration for replacing high-risk pipe. The quality of the information available makes it impossible for Liberty to provide a determination of the AMRP's likely schedule and completion date.

Examining changes in leak rates comprises a principal means for assessing the effectiveness of efforts to replace high-risk, leak-prone pipe. Acceleration of pipe replacement should reduce leak rates, but it has not. Instead, leak rates have risen in recent years. Peoples Gas would adjust those rates to account for: (a) accidental pipe hits that produce ruptures, and (b) recent, harsh winter weather. The latter factor causes ground movement that produces leaks. Even accepting the validity of the Company's adjustments, its analysis shows only a marginal reduction in leak rates.

The scope of Liberty's AMRP investigation included an assessment of reasonableness, and prudence, and whether the installations made are used and useful. The investigation requested a forward-looking examination of the AMRP. Even a future examination relies to a significant extent on where the program stands today and how it arrived there. In Liberty's view, the management of the AMRP falls short of good utility practice in some ways and short of best practices (or the "world class" standard that senior Company leadership accepts as a valid comparator) in others.

Liberty's examination did not, however, seek to render judgments about the past or to quantify any harm that may have resulted from a failure of prior management to conform to the standards by which the Illinois Commerce Commission may ultimately judge past performance. Liberty's work did seek to identify areas of future improvement. The standard applied in seeking such identification was "optimization." There generally exists a substantial range of performance between prudent and optimum. Liberty's work did not look only for improvements that would bring performance to the minimum levels required to be deemed prudent. The work also sought improvement opportunities that would move already sound performance forward; *i.e.*, if the team could find means to make the good even better it would identify them.

That said, Liberty undertook to answer the following prudence question, which conforms to the generally forward-looking nature of this engagement:

*Were Peoples Gas to determine to continue the AMRP in the future largely as it has been and is doing now, could one conclude that the program is being performed reasonably and prudently, in the absence of at least substantial changes along the lines recommended to improve future performance?*

The used and useful question presents somewhat different considerations. Liberty's work does enable a broadly applicable answer to the used and useful question in a historical and forward-looking context. Liberty formed the used and useful question to be answered by this study as follows:

*Should the AMRP work performed to date be deemed used and useful, and is program work planned for the future calculated to be so?*

Company leadership has described a "stop-and-start" approach to the AMRP's early years, driven largely by uncertainty in rate recovery issues. The Company also cited changes in City requirements associated with issues such as the extent of street paving, improvements to pedestrian crossings at intersections, and boring techniques. Those factors may bear on a retrospective examination of prudence. However, looking at prudence from a current perspective makes those factors marginal, at most.

With conformity to good utility practice as a guide, Liberty found a significant number of gaps in AMRP management, control, and oversight. One should anticipate an initial, material level of inefficiency and a gradual development of adequate management, control, and oversight approaches, resources and methods over an early shakeout period. The AMRP introduced a large and likely unprecedented "shock" to the corporate systems of Integrys and Peoples Gas. Liberty would have expected a number of the attributes forming the focus of the recommendations in this report to have taken time to develop and evolve. Particularly for companies operating in the gas delivery business, programs of this magnitude have arrived newly in corporate history and evolution. Thus the lack of institutional experience and familiarity with a program like the AMRP justifies a learning curve in identifying the particular management challenges presented. Interestingly, the use of PwC as a source of outside expertise early in the program's history gave an opportunity to shorten that curve. Peoples Gas seized this opportunity early in the AMRP's evolution, but did not follow through on it with sufficient aggressiveness.

Liberty concluded that the Company moved more slowly than appropriate to the AMRP's needs in developing approaches, organizations, resources, plans, estimates, schedules, and processes and tools important for ensuring effective and efficient AMRP planning and performance. Liberty answers the prudence question it considers appropriate in light of this investigation's scope as follows:

*It would be unreasonable and imprudent for Peoples Gas to continue the AMRP in the future largely as it has been and is doing now. The program requires substantial compliance with the recommendations of this report to bring it into sufficient conformity with good utility practice and to incorporate best practices appropriate to the program's scope, duration, and public importance.*

The concept of "used and useful" in utility ratemaking often becomes merged with the concept of prudence. Liberty's definition for purposes of this report separates them. The test that Liberty applied examines whether operation of the facilities involved provide benefit to customers, whether the existence of those facilities provides a needed service, or whether the facilities stand ready to meet a near and present service need. In general, Liberty views as already settled for Peoples Gas the question of whether replacing cast- and ductile-iron pipe, relocating meters from the insides of customer premises, and upgrading delivery systems to medium pressure can be

deemed to provide customer benefits. Legislative and regulatory policy appear to compel the conclusion that they do. Therefore, Liberty did not undertake to question whether producing these three results does in fact benefit customers.

Liberty's examination, which included substantial field investigations of work sites and observations of active installations, confirmed that the nature and general quality of the work support its use to accomplish all three improvements that public policy deems to provide benefit to customers. Liberty's field work found some instances of substandard installation, but at nowhere near the degree required to question the ability of the installations to replace high-risk pipe, to occasion the removal of meters to locations outside customer premises, and to upgrade the systems serving Chicago neighborhoods from low- to medium-pressure.

The materials and equipment being installed suit these purposes. This report addresses concerns regarding the failure to achieve significant reductions in leak rates, despite acceleration of main replacements under the AMRP. In major part, those concerns relate to the combination of performing high-risk pipe removal and to bringing entire neighborhoods to medium pressure as factors in prioritizing work. The concern lies in the degree to which adding other considerations to the work prioritization process may produce an under-emphasis on the AMRP-specific risks of high-risk pipe. Persistence of high leak rates may well occasion a public consideration of the balance among the objectives, but not to a degree that calls into question the usefulness of work already performed.

A related consideration is the current inability of Peoples Gas to quantify the operating costs, savings, and benefits of meter relocations and pressure changes. The Company cited them in support of its plans. Liberty places importance on the ability to calculate operating cost savings and benefits, as a continuing test of the "value" produced by relocating meters and increasing pressure.

The vastly increased costs that Peoples Gas experienced and likely will continue experiencing for AMRP, pressure increase, and meter relocation heighten the importance of ensuring a proper overall limit on the use of capital. Expenditures involve a magnitude that substantially affects customer rates. Leak rates from cast- and ductile-iron pipes failed to decrease substantially, expenditures have run far greater than anticipated originally, and further, substantial increases are highly likely (albeit indeterminable at present, given existing limits on cost modeling and estimating capacity). Questions with public interest implications thus do not limit themselves simply to determining whether all three system enhancements (iron pipe replacement, meter relocation, and pressure increase) meet the used and useful test. When one considers the likely rate increase consequences, questions arise about which type of enhancements prove most used and useful and how to balance expenditures among them.

Liberty answers the used and useful question it considers appropriate in light of this investigation's scope as follows:

*AMRP work performed to date is used and useful. Program work planned for the future is generally calculated to be so. Nevertheless, the large and growing cost of the AMRP and the failure of leak rates to fall substantially in the wake of accelerated replacement invite*

*consideration of the proper balance among replacement, pressure increase, and meter relocation work and costs.*

### **3. AMRP Management Plan**

A program like the AMRP requires an integrated, multi-layered set of plans. At the top of this planning hierarchy one should find a master plan (referred to sometimes as the Plan for Management). Beneath and integrated with this master plan should lie a more detailed plan of execution. At the lowest level of the planning pyramid rest the basic building blocks for setting and measuring against detailed performance targets for cost, schedule, production, quality, and resource requirements. An effective master plan should describe at a high level expected program scope, cost, quantities, schedule, expectations, and resources. Answering the question, “What is the AMRP?” should form the focus of this highest level plan. At the next planning level, the plan of execution, “How will we manage the AMRP?” should become the focus. This plan of execution should address the approach to managing the program as a whole, the approach for managing the program’s individual projects, the organizations responsible for each area of management focus, the cost and schedule programs that apply, means for assuring quality, the forms that high-level oversight takes, and the controls that management will employ.

At the outset of the AMRP, Peoples Gas created the Project Execution Plan. It included a level of detail that gave it the characteristics of the second hierarchical planning level. The AMRP did not have then or now a summary-level master plan document. The Project Execution Plan represented a strong initial effort, but fell quickly into disuse. Management has not updated it and the plan does not appear to have a continuing, vital role in addressing overall AMRP planning.

The AMRP warrants a world class organizational approach, as senior Integrys and Peoples Gas leadership acknowledges. The size, duration, and public importance of the program call for an approach that reflects broad application of industry best practices. The AMRP management organization, however, exhibited no such strength. Efforts to build an organization that brings a full range of skill categories and strong owner participation has not been a priority. Plans to build an organization that reflect a truly integrated group of Company and contracted resources have given way to a contractor dominated AMRP management organization. Management has built the organization without:

- A clear assessment of needed skills existing and required to be acquired or developed
- Actions designed to support a long-term organization
- Providing for a sufficiently strong and active level of owner participation
- Employing full-time, Chicago-based program management
- Effectively integrating the planning and execution of contractor versus employee-based work activities
- Sufficiently integrating the planning and execution of employee-based AMRP work with normal duties
- Succession planning for key positions.

The Company’s use of a matrix approach to program management (relying on a combination of Peoples Gas, Integrys, and contractor personnel) has proven particularly unsuitable to meeting AMRP needs. A matrix approach is a respected one for many industry applications. Nevertheless,

the size and complexity of the AMRP, combined with barriers to effective integration of Peoples Gas and Integrys resources, create a strong preference for a dedicated group operating under single management. Moreover, poor performance during the program's early years underscores the validity of that preference here. Another aspect that has detracted from the cohesiveness of program management arises from over-reliance on contracted resources from an outside firm. The firm has a strong industry reputation, but Liberty found the degree of reliance placed on contracted personnel too strong. Few internal Company resources populate the management team. The program manager, an Integrys employee, is based outside of Chicago. Other Integrys members of the program management team occupy more peripheral, rather than central roles. Peoples Gas is not represented on this team, but manages its AMRP work under separate authority and accountability.

The Company needs, as a matter of first priority, to re-examine the now disused Project Execution Plan. The plan needs a fundamental overhaul to bring it up to date and to fully address AMRP needs. In undertaking this plan revision, the Company needs specifically to address the failure of the initial plan to remain vital, in order to ensure that its replacement does not fall into disuse as well.

Peoples Gas should accompany this new Project Execution Plan with a summary level master plan addressing the overall approach to key program parameters, including:

- Establishing a valid cost estimate using enhanced estimating, modeling and processes
- Developing realistic short-and long-term schedules, which need to integrate engineering, permitting, construction, and completion activities
- Creating a structured, comprehensive set of resource planning processes that address staffing and contractor use strategies, integration of AMRP and non-AMRP work by Peoples Gas employees, training and development needs, and important production and productivity measurements
- Instituting a cost management program that promotes a culture of cost control, and supports it with skilled resources, critical performance analysis, and management and executive level direction and oversight
- Employing a program that controls upward scope "creep" that unduly threatens program cost and schedule on any program having characteristics similar to those of the AMRP
- Seeking contracting and procurement approaches that take full advantage of opportunities the AMRP provides for favorable contractor, supplier, and vendor agreements.

Developing a sound, long-term organizational approach presents a critical challenge. Peoples Gas needs to reorganize its approach to overall AMRP management to provide for a stronger, locally-based employee contingent within the organization. The Company needs to bring under a single senior leader the responsibility and accountability for both the contractor- and employee-performed work in the areas of planning, execution, and measurement. A structured assessment of current skills gaps relative to program management needs must occur in the near term. Development needs over the duration of the program (and consideration of what management, leadership, and technical skills will be built for internal use after its end) also require assessment and the creation of plans and programs for fulfilling those needs.



#### 4. Risk Assessment and Replacement Prioritization

Best practice calls for the use of sophisticated methods for prioritizing pipe replacement. Such methods should specifically and analytically assess the risks of breaks in pipe of various types, vintages, and locations. Peoples Gas has used generally suitable means for assessing risk and for prioritizing replacement for many years. The Company's methods underwent outside review some time ago.

At AMRP inception, Peoples Gas used its "Main Ranking Index" to apply information about pipe characteristics in a manner that produces numerical rankings of risk. The highest ranked pipe segments have priority in replacement prioritization. In 2013, the Company began to apply a "neighborhood" approach. Dividing the City into 228 zones, this approach combines AMRP work with a program of updating system pressures and relocating meters from the inside to the outside of customer buildings. This other work qualifies for accelerated recovery under the legislatively authorized Qualifying Infrastructure Plan Surcharge.

The introduction of the neighborhood approach created a sound overall means for combining AMRP work with the other two priorities created by the Qualifying Infrastructure Plan Surcharge. Liberty also observed that the Company follows its existing ranking systems in prioritizing work. Liberty found counterintuitive and troubling, however, the failure of accelerated replacement to produce a more substantial rate of leak reduction. The Company has not recently analyzed the continuing validity of its ranking criteria and the weightings assigned to them. In particular, the weight given to main installed before 1920 raises questions. Peoples Gas needs to examine the continuing validity of those criteria and weightings in light of the failure of leaks to fall as replacement work has accelerated. Should that examination confirm their validity, then Peoples Gas still needs to examine means for refocusing efforts to bring leak rates down faster.

City street work has for some time formed a factor in prioritizing work, given, for example, bans on street work after City repaving. A planned, substantial increase in such work by the City may cause further diversion away from replacing highest-risk pipe first. This projected increase brings more importance to ensuring that expenditures go sufficiently to the replacement of highest-risk pipe.

Sound prioritization also depends on the accuracy and completeness of data. Best practice calls for the use of a quality assurance and control program to ensure data adequacy. Peoples Gas does not have, and needs to adopt and apply, such a program. The Company also needs to add soils information to its roster of data used for prioritizing replacements. Building a data base of soil conditions across the City will permit Peoples Gas, as AMRP work proceeds, to determine in an analytically supportable way the degree to which different soil conditions may affect leak risk for its mains and services.

Risk reduction should comprise the highest priority in identifying and prioritizing replacement work. Peoples Gas has in the past justified expenditures on the basis of savings in ongoing operations and maintenance costs as well. Liberty would strongly emphasize the continuing primacy of high-risk pipe replacement, particularly given the lack of significant decline in leak rates. Nevertheless, the Company does not have a method for soundly analyzing the differences in operations and maintenance costs with and without work performed to replace leak-prone pipe,

increase system pressure, and move meters outside. Peoples Gas has expressed a commitment to developing this capacity, which it should establish with dispatch, and then rigorously and continually apply.

## 5. Cost Planning

A long-term cost plan provides an important foundation for planning and managing AMRP work. The long-term estimate originally made for the AMRP used a comprehensive set of assumptions, sound methods, and adequate scope definition. The estimate used reasonable for the time estimates for materials, labor rates, and annual production rates. Assumptions regarding engineering costs, unit meter installation rates, contractor unit costs, appeared low, however. The estimate did not consider contingency, nor did it address cost and schedule risks quantifiably or analytically. It also did not treat ramp-up and demobilization costs effectively.

The 2009 estimate projected \$2.63 billion in total costs, which grew to \$4.45 billion under a 2012 estimate. This nearly three year old estimate remains the latest produced. With estimated quantities remaining largely the same, the major sources of cost growth have come in unit rates for work on mains, services, and meters.

Neither management nor public stakeholders should consider the most recent estimate a reliable indicator of final AMRP costs. Reports to Liberty of the pendency of a new estimate in mid-2014 turned into an announcement of commencement of a program that would first have to build the cost modeling capability needed to produce a credible estimate. The lack of such a capability so deep into the planned length of the program reflects a significant gap. It is discouraging that a new estimate still remains sometime off in the future more than half a year later.

Another factor diminishing confidence in Company knowledge of costs arises from lack of monitoring of quantities, unit costs, and productivity at a detailed level. Management (and in turn senior leadership and board oversight) requires reporting and analysis of at least such data to gauge the continuing reliability of the total AMRP cost estimate. Finally, management has not applied (and monitored the rate of consumption of) contingency or reserve. That lack does not comport with good practice on a program of the AMRP's size, complexity, and duration. The program remains exposed to internal and external sources of cost risk over time.

As a result, the AMRP currently operates without a long-term cost plan and a credible estimate of final program costs. Efforts remain underway to correct this deficiency, but it should not exist at this stage of the program. Development of such a plan and estimate need to address long-term cost risk through an analytical and managed approach to contingency or reserve use. Management needs to accompany the development of a long-term cost plan and estimate with a substantially restructured and strengthened program for collecting the data that enable it to understand and quantify the impacts of major program cost drivers. Doing so will support cost optimization efforts and keep management, senior leadership, and outside stakeholders informed on a current basis about final program costs and risks that threaten estimates of those costs.

## 6. Schedule Planning

The AMRP uses a projected annual spending amount to drive schedules. No long term schedule exists. Rather, the approach taken effectively assumes that the Company will meet (or not meet) twenty-year target program duration to the extent that pre-set spending limits end up supporting the roughly 100 miles per year pace required. The first four AMRP years have produced an annual rate of only 70 miles. This pace suggests the existence of a substantial threat to program completion in 2030. Liberty found no Company analysis of the impact of the rate to date on the ability to complete work in the planned 20 years. Liberty also found no evidence of recovery plans seeking to support completion by 2030. Liberty concluded from these circumstances that an annual spending limit, rather than targeting 2030 completion, serves as the driver of work scheduling.

Short-term scheduling addresses the work of contractors, who perform main and service installations. It has not addressed engineering, design, or permitting. Short-term scheduling has also not integrated the work performed by internal Peoples Gas crews. Contractors operate under management by the Integrys Project Management Office. This Office operates under the Integrys Business Support group. The Peoples Gas work focuses on making customer connections to the replaced mains and services (*e.g.*, tie-ins of new to existing mains, moving meters from inside to outside customer facilities, retirement of old mains, gassing in customer buildings, relighting customer appliances, relocating interior piping because of meter movement to the outside, and other associated customer work).

The lack of schedule integration for all groups and activities supporting AMRP work has contributed to problems in timely and effective work completion, and in managing relationships with the City of Chicago. Meeting permitting requirements for work in public rights-of-way comprises a central AMRP work element. Peoples Gas states that it has begun efforts to integrate these short-term schedules in a way that will support efficient and effective work performance. Executing the announced plans to place contractor and Peoples Gas Crew work under a single source of day-to-day direction from a Peoples Gas-led manager should also improve work integration.

Program management also needs to build installation quantity and personnel resource components into scheduling. Management needs to complete work now under way to build time-based quantity (production) targets into project schedules, in order to provide a better gauge of the rate at which work progresses. Resource availability, particularly within Peoples Gas, has proven a barrier to timely and effective work completion. The Company needs to consider all work performed by its internal crews (not just AMRP work), in order to produce meaningful expectations about what AMRP work those crews can accomplish and to identify required resource augmentation. The Company also needs to develop and apply a structured and comprehensive program for identifying recurring issues affecting schedule progress. Management then needs to analyze regularly the information gained to assess the degree to which annual work (scheduled and performed) supports 2030 AMRP completion.

## 7. Resource Planning

The AMRP will require very large amounts of contractor and internal labor across a 20-year duration. Effective resource planning requires balancing work among these two sources of

personnel, considering overtime and shift work, securing favorable work rules, analyzing long term craft resource availability, and providing for sufficient training and development.

AMRP management has not prepared or used long-term resource plans to support optimization of AMRP work. In the short term, the contractor/employee balance and the efforts to promote efficient work rules have proven sound. However, for the longer term, Peoples Gas needs to develop a meaningful level of internal capability to perform main and service installation. This capability can serve as a hedge against the increased strain on contractor resources that could result from increased use of accelerated pipe-replacement programs across the country. The Company also needs to adopt a structured approach to determining resource allocation and to determining the optimum use of overtime and shift work.

## 8. Scope Control

Controlling the scope of any megaproject or massive program like the AMRP requires dedicated focus and constant attention. Like performance and execution problems (*e.g.*, productivity) changes in design, project requirements, and other drivers of total work can present worrisome sources of cost increase. The importance that leak-prone pipe replacement plays in public safety makes delay another critical variable to consider in controlling program scope. At the program and at the senior leadership oversight levels, AMRP scope control has too narrow a focus. It focuses overwhelmingly on contractor change requests. Addressing such requests carefully has merit, but Peoples Gas needs to add a program level view of scope control. The AMRP budget grew from \$2.63 billion in 2010, rose to \$4.45 billion in 2012, and appears destined for another significant increase after the Company completes efforts required to support a new, credible estimate. The Company needs to develop a more broad and structured scope control program, consisting of:

- A baseline supported by a credible total-duration estimate and schedule
- A process for promptly identifying changes to this baseline
- Technical analysis of proposed changes
- Structured assessments of the cost and schedule impacts of proposed changes
- A formal and documented process for management and senior leadership review and approval of changes.

## 9. Cost Estimating

A sound approach to, organization for, tools supporting, and work products governing cost estimating lie among the most critical resources for planning a program such as the AMRP. Beyond the role of cost estimating in planning, however, comprehensive, current, reliable cost estimates also play a central role in program and project management. Unfortunately, Liberty found the AMRP operating in 2014 without the ability to establish a program cost estimate on a sound footing. The program thus lacks a credible estimate. For a program already approaching \$5 billion dollars, that absence raises considerable concern. It is encouraging that Peoples Gas recognizes the need for substantial strengthening of its estimating capabilities. Developing the capability must, however, proceed with great dispatch and as a matter of first priority. The program simply cannot continue long without a credible estimate. The lack of one not only substantially impairs the Company's ability to manage the program. It adds materially to stakeholder concern about how large, long, and expensive the program will ultimately prove.

Developing the modeling tools required for sound capital and operating cost estimates, while a critical starting point, will not alone prove sufficient. Peoples Gas needs to bring together what are now fragmented groups responsible for cost estimating. This successor organization requires formal guidelines and procedures, the introduction of professionals skilled in estimating (and having sufficient technical knowledge of AMRP work requirements), and formal programs for training personnel. The lack of regular updating of key cost inputs also detracts from estimate reliability. Estimating also suffers from the lack of structured analysis of actual versus estimated costs. Such analysis proves critical to maintaining current and reliable estimates.

## 10. Cost Management

The management of costs, particularly for large scale, long duration programs or projects like the AMRP has moved well beyond an accounting focus. That traditional focus places primary emphasis on cost data collection and reporting. How that information is used to optimize performance has become the driving force behind best-practice concepts of cost management. The AMRP, however, has operated in accord with that older and less useful concept. In significant part, Liberty considers this approach a result of the use of annual budgets as the paramount work driver. Spending up to the budget, but not over it emerged repeatedly as the mindset driving program management, and in turn those responsible for reporting cost performance. One must consider what role the limits on accelerated rate recovery have played in producing this focus.

Two principal concerns arise from this approach. First, the safety risk mitigation goals of the AMRP require sustained production (*i.e.*, replacement) levels. If not met, they both threaten a 20-year completion goal and permit higher amounts of high-risk pipe to remain in operation longer. Second, optimizing cost requires much more than examining conformity to total annual spending levels. It requires analysis of the factors driving costs, in order to support the identification of performance improvements. Liberty's work shows the program already to have lost perhaps a year of progress against overall program schedule. Cost performance also has not come near initial expectations. Costs have grown by about 70 percent since 2009, and appear destined for another significant increase in 2015.

Liberty recommended that Peoples Gas adopt a major change in addressing costs. The holistic approach that would result involves:

- Adopting a robust cost-management culture that makes costs a priority
- Supporting that culture through strong and continuous executive commitment, communication, and oversight
- Creating a structured plan that defines how cost management will occur and who will have accountability for it
- Creating and using well-developed policies and procedures
- Developing supporting systems, tools, reports, and analytical skills.

The changes in organization, staffing, skills, tools, reporting, and analysis discussed in the preceding cost estimating section will support this fundamental change in approach. Recently begun Company initiatives to address AMRP needs include significant changes in cost estimating and management. They do not, as yet, reflect a full transition to the holistic approach that Liberty recommends. Reaching that state will involve a multi-year developmental period, given where the program finds itself now.

## 11. Procurement and Contracting

The AMRP uses contractors to perform main and service installations, with Peoples Gas crews responsible for making customer connections to the replaced mains and services. The costs associated with these contracts drive the bulk of program costs. The costs and the very large scale of work required from outside resources necessitate a structured and comprehensive method for selecting and managing contractors. Use of contractors for this portion of AMRP work comprises a sound approach. The Company, however, needs to examine use of internal resources for some work, in recognition of the increasing focus across the country on leak-prone pipe replacement. Developing an internal capability from which to leverage skills will operate as a hedge against any large growth in demand for contractor resources in the coming years.

The packaging of work into a variety of “bundles” has supported participation in bidding by contractors of differing sizes and by those occasionally experiencing limitations on large work undertakings. The Company lets work under a competitive process. Peoples Gas has not, however, sought long-term, partnership arrangements. Liberty believes that the AMRP lends itself to such arrangements, given the attractiveness to potential contractors of a long-term, secure relationship, subject to continued effective performance. A process for evaluating contractor performance exists, but Liberty did not find evidence of its use in ranking contractors bidding on future work.

The arrangements with contractors employ fixed-price or unit-cost arrangements, which makes change orders critical. The change order process governs contractor requests for increased compensation to account for unforeseen developments. Those change orders produced nearly \$150 million in added costs through 2014. Liberty did not find analysis of these changes in a manner or at a level commensurate with their size. Moreover, Peoples Gas does not require contractors to provide performance information, believing that the nature of the contracts places on contractors risks of production and productivity shortfalls. This approach, however, fails to recognize the value that such information has in assessing the validity of change requests and in estimating future work cost and schedule requirements.

The AMRP requires very large amounts of material, generally consisting of fairly standard items. Liberty found that the material procurement process supportive of program needs in a reasonably efficient manner. As with contractors, however, Peoples Gas has yet to explore more aggressive and creative ways of taking advantage of the AMRP’s scope and duration to develop creative supply relationships.

Adequate systems exist to aggregate and manage material procurement and management. Data confirm two measures of effectiveness; *i.e.*, the absence of significant material delays and a general lack of overstocking. However, the Company experienced a lag in 2014 production, accompanied by an increase in material held in storerooms longer than expected. Project reports should address this issue, in order to permit management to verify that transient production issues, rather than problems in ordering, underlie any future imbalances in material availability.

## 12. Executive Oversight

The magnitude and duration of the AMRP require continuous attention by senior executive leadership and by the gas and holding company boards of directors. Transparent priorities, goals,

and the forecasted time and costs required (and how they may change over time) are essential. Public safety also comprises a paramount objective. Keeping the Illinois Commerce Commission and stakeholders aware of how much, how expensively, and how timely risk is being mitigated comprises an important priority. Top executive management and the boards should provide strong commitment to meeting (and changing as circumstances require over time) expected total duration, costs, and results. These important AMRP parameters involve considerable uncertainty. Leadership should have a credible description of possible ranges of schedule, cost, and results outcomes over the short- and long-term.

Liberty's work through early fall 2014 did not find top leadership highly conversant with performance issues. We did find attention to information about the program, but not under a structured and well-defined set of oversight, monitoring, and decision authority guidelines, information requirements, and points of control. Top-level oversight did not appear to operate under a regular, consistent schedule, or require or use key performance metrics.

To a great extent, unmet needs at the program management level make structuring and executing a top-level oversight program challenging. The development of needed AMRP plans, reporting, and analysis capabilities and responsibilities will, when completed, provide a more sound basis for providing senior executive and board leadership with the data and (more importantly) analysis it needs to validate (and to adjust where warranted) the continuing propriety of AMRP cost, schedule, and quality objectives and targets.

Liberty made a series of recommendations for improvements needed to support the execution of senior oversight in a manner commensurate with AMRP needs. These recommendations address:

- Adopting comprehensive AMRP targets and priorities
- Ensuring the provision of insights into gaps in meeting them
- Establishing sufficient reporting at an appropriate level of detail
- Ensuring that senior-level oversight operates independently from program-level leadership
- Ensuring that senior-level oversight occurs with sufficient frequency and at a suitable level of detail
- Meeting the need for continual re-evaluation of AMRP expectations
- Creating and applying a structured communications plan for ensuring knowledge and acceptance of program targets
- Ensuring effective communication of program status and gaps to outside stakeholders.

### **13.Reports and Analysis**

The AMRP requires regular and comprehensive performance reporting and analysis. These tools provide the basis for determining the degree to which performance meets cost, schedule, quality, and safety risk mitigation objectives and targets. Where they do not, analysis of root causes and corrective actions become necessary to optimizing performance, either through prompt adjustment of objectives and targets that have become unrealistic as time passes, or through measures to improve the ability to perform up to expectations.

The AMRP has not made effective use of performance data and program management has not aggressively targeted performance improvements identified through the analysis of such data. Program management issues regular reports, but Liberty found them of a scope or focus insufficient to support sound performance measurement. The AMRP monthly progress report forms the central program reporting tool. It provides much information, but often lacks context (*i.e.*, a basis for judging whether performance is good or bad), fails to provide some important data, contains errors, and uses metrics not clearly related to performance effectiveness. Most importantly, it lacks the analysis needed to draw conclusions about the attributes of performance that drive cost up or down, lengthen or shorten schedules, and increase or decrease quality. At the more senior levels responsible for program oversight, these problems become particularly pronounced.

Key planning, budgeting, estimating, and schedule elements either have not existed or have not exhibited sufficient credibility to serve as effective reporting bases. This gap contributes to the difficulty of defining a credible reporting and analysis process that gives: (a) program management the tools it needs to optimize performance, and (b) senior level executives and board members a digestible, actionable basis for holding program management accountable for pursuing such optimization. Preceding parts of this summary and the following report chapters discuss these key planning and management foundations.

Effective reporting and analysis on a program like the AMRP requires a dedicated and highly experienced group of professionals responsible for project controls. Liberty's review of the personnel who perform this function demonstrated a sound experience level.

Liberty recommended a fundamental revision of the AMRP reporting process, the creation of a sound framework for identifying performance improvement opportunities, a redefinition of cost, schedule, and production (levels and quality) performance standards, and the creation of a corporate and program culture that emphasizes the value of and produces a programmatic approach to insightful AMRP performance analysis.

## 14. Auditing

Regular testing serves an important purpose in ensuring the intended use of resources. Peoples Gas used Integrys based Internal Audit Services and an internationally respected outside firm (PwC) in a fairly typical fashion in designing and applying an auditing program that considers AMRP risks. The Company, however, needs to augment its examining and testing of contractor and material and equipment handling, in order more fully to meet the challenges of the AMRP. With respect to contractors, reviews of the procedures by which contractors justify cost increases need follow-up to verify adherence to those procedures. Issues that have arisen with respect to the control of material and equipment produced a long-term improvement program. That program requires dedicated executive sponsorship to ensure full and timely implementation. Finally, Peoples Gas needs to act promptly to ensure the accuracy of material and equipment costs charged to the AMRP.



## 15. Field Work Performance

Liberty's field work inspections included a review of workmanship, suitability of materials used, conformity to engineering standards and construction requirements, safety, and the skills of the workforce. The vast majority of the material used comprise pipe, fittings, and valves of standard types used in typical configurations. The new pipe observed at sites inspected by Liberty generally met age and technical requirements and specifications. Liberty found material sufficiently available to support installation requirements efficiently. However, Liberty also found an inability to identify a solution for securing service risers by use of brackets in cases of crumbling or bowed foundation walls.

Construction conformed generally to proper engineering standards, with three exceptions: reinforcing straps on endcaps, testing the integrity of coatings for steel pipe, and sizing of thrust blocks that hold mains in place. Liberty also found a need to address a number of training, inspection, and auditing aspects as well. Contractor operator qualification and field inspector training require enhancement. Construction inspection documentation requires more uniform execution and documentation. Peoples Gas also needs to ensure consistent adherence to procedures requiring verification audits of main and service installation compliance with Company engineering standards.

Liberty's field investigations confirmed the job site presence of applicable standards and procedures. Work appeared to conform to engineering and design documents, except where unanticipated field conditions required adjustment. Five specific issues that can cause cost increases due to rework, cumbersome installation methods, or larger amounts of materials, however, warrant attention:

- There exists confusion over what depth of cover is required atop installations
- Adherence to pre-designed main locations sometimes produces installations less efficient than evident, available alternatives
- Rote application by one of the three Shops of a direct burial requirement to all mains of at least six inches in diameter produces inefficiencies that the Company can avoid
- Multi-meter locations have sometimes produced interior piping runs of lengths greater than necessary.

The section below (under Part Four) addressing Safety and Permit Compliance discusses the need for improvements in ensuring worker and public safety. In terms of managing the field work, Liberty found traffic control (an essential element in mitigating vehicle and pedestrian safety risk) effective. Liberty's field investigations encountered conditions having worker safety implications. More broadly, however, it is important to observe that contractor worker safety far exceeds that experienced by crews consisting of Peoples Gas employees. That result runs counter to Liberty's general experience, and underscores the need for the safety improvements discussed below.

The skills and experience of contractor crews installing mains and services appeared sound and observations of their work disclosed no unusual level of difficulties or problems. Peoples Gas, like all others in the energy distribution industry, suffers from the effects of a generally aging workforce. The Company needs to adopt a set of measures that will:

- Induce experienced people to stay on board

- Encourage movement from bargaining unit into first line supervisory positions
- Aggressively address skill shortages in some areas
- Limit job rotations that create critical AMRP vacancies
- Develop a program that develops a core internal competency to serve as a hedge against the risks that national expansion of leak-prone pipe replacement programs will leave the Company facing a shortage of contractor resources.

## 16. Work Management

Modern practice bases the definition and management of work on the discipline of work management. Modern work management systems create a system of defined work processes, subject them to defined sets of procedural rules, define the data used to manage them, support the establishment of resource and time requirements associated with them, and enable ongoing evaluation of effectiveness in work performance and the identification of changes that will optimize performance. Liberty found that AMRP program management employed reasonably comprehensive work management processes, which appropriately support construction work.

Liberty did, however, determine that the Company should assign a project manager to each of the projects comprising AMRP work, in order to provide a single source responsible for all areas that create project risk (such as coordination of City of Chicago permits, which has remained a source of significant performance and government relationships difficulties). In addition, the lack of regularly reported, sufficient performance data inhibits the ability to undertake on a continuing basis the robust review of work process improvement opportunities that a program of AMRP's size and duration present. Adding controls specialists would also enhance efforts to identify work process improvements. The next two sections address compliance with public requirements and coordination with the City of Chicago. For reasons addressed there, Peoples Gas should also dedicate within the Project Management Office a single manager to coordinate, monitor, and measure performance under the multitude of City permits required to authorize work involving public rights-of-way.

## 17. Safety and Permit Compliance

Work on gas distribution facilities must occur in conformity with public and employee safety requirements (federal and state) and with permits issued to work in and around pedestrian and vehicular rights-of-way. Liberty reviewed safety violations over the preceding two years, and examined compliance with permits to conduct work in and around City of Chicago streets (issued by the City Department of Transportation).

Liberty found that the number and severity of violations continue (as we found in work performed some five years ago for the Illinois Commerce Commission) to indicate the need for a senior-management led effort to escalate and to reinforce at all levels the need for making compliance with safety and permitting requirements an integral element of performing work in the field. The Company lost experienced inspection and supervision resources in recent years, and has vacancies in these positions. The resulting gap contributes to its too-frequent instances of safety and permit non-compliance.

A number of field observations made by Liberty identified issues contributing to compliance problems:

- Absences of field supervisors for some crews
- Inaccurate meter markings by inexperienced and insufficient (in numbers) personnel
- Low levels of experience on the part of contractor crew inspectors
- Dispersed responsibility and unclear authority in providing technical training and performing on-site compliance monitoring
- Gaps in required operator qualification knowledge
- Questions regarding authority over quality control programs and training
- Lack of processes for sharing field knowledge to identify best practices.

The Company needs to address these issues through developing enhanced safety programs, assigning an executive to champion the commitment to safety, instituting a strong safety communications program, setting aggressive goals, regularly measuring performance, analyzing the root causes of problems, implementing responsive improvement programs, increasing the stability in and numbers of field supervision and inspection personnel, clarifying responsibilities and creating training programs for technical training and for compliance monitoring, expanding operator qualification training, and exercising more clear and direct authority over contractor quality control programs.

## 18. Government Coordination

However well managed, a program like the AMRP must prove a substantial inconvenience to the public. Occupancy of public rights-of-way, whether in the streets themselves or in the adjacent parkways, means substantial physical disruption and barriers to vehicular and pedestrian mobility. The City of Chicago uses a permitting system to manage that disruption and to ensure a post-construction return to normal conditions. City requirements address when work may be performed, what restoration requirements apply, and how work gets coordinated with that of other street occupiers. The City also has rules that concern its own work, which includes projects like scheduled repavings, upgrades (e.g., intersection ramps for wheelchairs), and work on underground municipal utilities. Although large in its own right, the AMRP's requirements only add (and sometimes marginally) to an already extensive number of required permits. For example, AMRP permits have involved as little as 13 percent of the permits that Peoples Gas has required annually from the City. The Company must also meet state requirements for roads under Illinois Department of Transportation jurisdiction and for rail crossings.

The challenges of working in and around the streets takes dedicated management and careful attention to meeting public requirements. Experience across the early years of the AMRP strained relationships with the City substantially. The City had to adjust to the work levels and the inconvenience caused. More importantly, Peoples Gas had to plan for and work in accordance with permit requirements that imposed time windows for work performance, along with substantive requirements regarding that performance and the need for restoration work following completion. The Company experienced very large numbers of permit issues. Lack of permits (which includes permit expirations) and restoration caused the largest numbers of violations. To a large extent, these problems exhibit planning and scheduling difficulties. Specifically: (a) AMRP management has not integrated permit (and engineering) scheduling with construction scheduling, and (b)

Peoples Gas crews have experienced numerous delays in completing their work after contractors complete main and service installations. These two weaknesses caused permit durations to fall out of sync with construction activities, and for completion work to hamper and delay required restoration activities.

Peoples Gas reorganized its City-contact function in 2014, assigning a management-level position to replace a person who previously coordinated relationships with both the City and the State. The Company also added to the complement of employees responsible for (among other matters) permit issues. Senior level biweekly meetings now address interaction with and problems caused for the City. The City considers these changes a positive development, as does Liberty. However, they need to continue to remain effective. More importantly, they will ultimately prove ineffective if permit compliance does not become a more important priority to AMRP management. Making it a priority will take successful implementation of many of the program planning, management, and field work performance issues recommended by Liberty, many of which Peoples Gas reports to be in process of implementation.

Liberty's specific recommendations (apart from the designation of project managers for individual AMRP projects) included:

- Integrating engineering and permit activity schedules with construction work schedules
- Using what Peoples Gas says is an existing capability to develop and use a comprehensive data base of permit applications and citations to manage compliance and identify improvements
- Working with the City to identify reports of mutual value that the City Department of Transportation systems can produce
- Improving the currency and accuracy of the database used to manage railroad crossing requests.

## 19. Customer Coordination

Completing replacement work requires access to customer premises for required meter location changes and to cut service over to new supply facilities. Effective customer interaction and communication also serve to set reasonable expectations with respect to necessary disruptions to streets, driveways, lawns and sidewalks. Communication timing and content play an important role in minimizing customer dissatisfaction with what, in the best of circumstances, must be an inconvenience.

Peoples Gas launched the AMRP without a finalized Customer Communications Plan. It operated under a draft plan in 2011, but did not update it until 2014. Even at the time of Liberty's field work, the plan did not address means for: (a) dealing with customers who fail to cooperate in permitting access, or (b) gathering current information on needs, expectations, satisfaction, and feedback as the program progresses. Liberty also found that the Company did not operate under a common set of customer communications methods, which risks customer confusion. This approach can also produce inconsistent understandings between the common Contact Center and field personnel that contact customers door-to-door. This confusion can produce uncertain or erroneous information to customers. There is also a lack of integration between the current customer information system and the system that the three Shops use to manage field work. This

linkage will not happen until the institution of a new customer information system (“Cfirst”) in the next two years.

The Construction Complaints group handles customer complaints about the AMRP. It does not have sufficient staffing to handle the complaint volumes. There are significant delays in first contacts with customers following complaint receipt. The number of complaints unopened (*i.e.*, awaiting assignment of a Company representative) grew substantially through 2014. Complaints can take months to resolve. Complaints also increased after the decision last August to offer Saturday appointments.

Liberty recommended that Peoples Gas address the gaps in its now final Customer Communications Plan, standardize its processes for setting AMRP customer appointments, ensuring the integration of customer information and work management systems to permit tracking and communication of progress to customers, and increase staffing in the complaints handling group. The Company also should begin to measure on a regular basis: (a) customer satisfaction with their AMRP experiences, and (b) the effectiveness of AMRP customer communications and service.

## **20.Liberty’s January 2015 Interim Report**

Liberty’s scope of work did not contemplate an interim report. However, early work led to a number of observations about a series of significant improvements in core elements of effective AMRP oversight, management, and control. Liberty discussed these observations with senior leadership of Integrys and Peoples Gas, beginning in September 2014. Those discussions led to substantial consensus on where improvements could be secured. Liberty found senior leadership open to major change and willing to question the continuing wisdom of its AMRP approach, organization, staffing, responsibilities, systems, tools, processes, and activities. Liberty’s January 2015 interim report addressed a significant number of improvement opportunities with which leadership agreed, and reported generally on initiatives to which management expressed a commitment to implement.

Continuing work, which led to this final report generally confirmed the validity of those observations, and produced a number of additional conclusions identifying the need for further improvements in AMRP management, control, and oversight. As described, the Company’s proposed initiatives together reflected a substantial response to the observations Liberty made as part of last fall’s discussions. The prompt development and sustained implementation of these initiatives, as described by Company leadership, would represent a sound start and make significant progress in responding to the broader recommendations of this final report.

The effort to implement those initiatives and to address the full scope of this report’s recommendations, however, will prove massive. In some cases, it will take more than a year for corrective actions to become fully effective. Given a past history of not following through on recommended changes, the size of the effort indicates a need for the Company to retain outside expertise to assist in the change management process. Even so, the Company should be able (and expected) to bring greater definition to its described initiatives by the time of this report’s issuance. In many cases, it should be prepared to report that it is far along in implementation.

This report does not seek to evaluate those initiatives for three reasons. First, their status made them in many cases amenable only to general description for Liberty. Second, most were not far along in implementation. Third, and most important, this final report needs to provide a comprehensive description of all the changes that Liberty considers appropriate and an explanation of the reasons that underlie them.

Liberty found changes in leadership and openness to making fundamental changes to AMRP management, control, and oversight encouraging. Uncertainty surrounding future ownership (and therefore personnel continuity and change commitment) certainly make it prudent to temper optimism. Inaction with respect to change in the past underscores the need to remain cautious about outcomes. Therefore, while Liberty believes that aggressive pursuit of the initiatives remains appropriate, we offer this final report as a stand-alone and more complete description of how Peoples Gas has managed the AMRP and what improvements remain before it.

## *Chapter C Table of Contents*

Chapter C: The Peoples Gas Distribution System .....	C-1
1. Background .....	C-1
2. Findings.....	C-1
a. Typical Urban Gas Systems.....	C-1
b. Peoples Gas System Configuration.....	C-2
c. Cast and Ductile Iron Pipe Characteristics .....	C-4
d. Legacy Low Pressure Gas Systems .....	C-6
e. Plastic Pipe’s Advantages .....	C-7
f. Complementing an AMRP.....	C-7
g. Leak Management.....	C-9
h. Double Decking .....	C-9
i. Other Safety and Reliability Considerations.....	C-10
j. System Statistics .....	C-11
3. Conclusions.....	C-11
4. Recommendations.....	C-15
Chapter C Appendix: Comparisons with Companies Having >500 Combined Miles of Cast and Ductile Iron Main.....	C-17

## Chapter C: The Peoples Gas Distribution System

### 1. Background

This chapter addresses the following characteristics and conditions of the Peoples Gas system:

- Current inventory of problematic main and services materials and their location
- Whether the most leak prone mains and services are also those with the highest safety risk
- Metrics that determine which problematic materials must be replaced initially and which can be deferred without reducing safety
- Past programs to reduce safety risk and improve safety via infrastructure improvements
- Lessons learned from the conduct of prior programs.

### 2. Findings

#### a. Typical Urban Gas Systems

The gas systems of large urban gas utilities combine very old with more modern components. One disadvantage of older components arises because their interconnection with newer ones frequently limits the ability to take advantage of the capabilities offered by the newer materials. The continuing use of aged components, some of them more than 100 years old, however, raises a far more important concern; *i.e.*, gas leaks that pose major safety risks for customers and employees. The country's worst performing systems from a risk perspective typically share a number of characteristics:

- Cast iron mains: brittle and installed in roughly 10 foot segments connected by unreliable joints
- Ductile iron mains: subject to unpredictable breaks and also connected by unreliable joints
- Bare steel mains: subject to exponential degradation over time and numerous leaks
- Some early vintage plastic mains and services: found to consist of poor performing materials
- Coated steel service and mains not adequately protected cathodically
- Services that employ similar, poor performing piping materials
- Low-pressure systems: not capable of upgrade to higher pressure operation, due to connection to poor performing pipe
- Pressure regulating vaults and regulator systems for reduction to low pressure: typically dating to the early 1900s
- Services not capable of shutoff from outside the building: often no valve exists or it cannot be located or operated
- Inside meter sets: outside location is generally optimal.

Utility gas system configurations typically employ two flow modes, often in combination: (a) tree, and (b) grid. Tree configurations typify rural systems having low customer densities. Tree configurations use a main supply line as a trunk, from which branches spread to feed communities or individual customers. Tree systems almost always operate at high or medium pressures. Damage to the trunk can cause loss of service to all of its branches, thus making them subject to widespread outages.



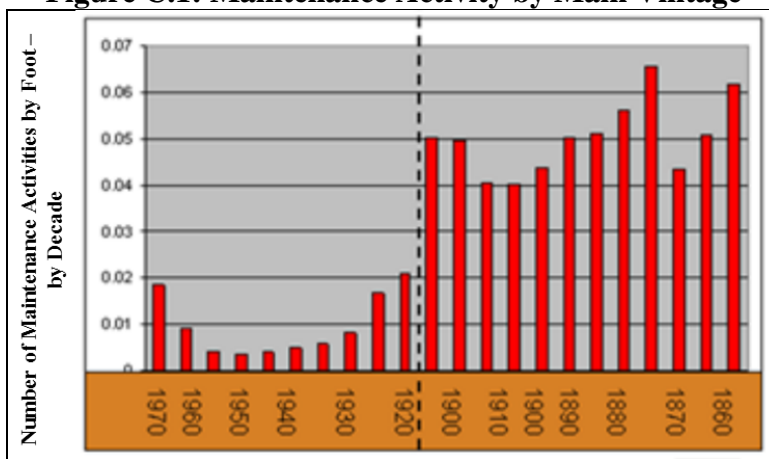
Grid configurations typify urban environments. They typically consist of interconnected mains, visually much like the lines on a piece of graph paper. Grid configurations offer the advantage of multiple feeds to each element of the grid. Undamaged nodes in the system flow into and around a damaged section, minimizing the number of customers interrupted. Grid systems cannot fully match the “graph paper” model; natural features and geographic limitations (*e.g.*, river crossings) impose insurmountable physical barriers. Utilities operate grid systems at low and at medium pressures, depending on a number of circumstances. Increasing the operating pressure from low pressure has advantages that include:

- Lower cost (often a two-inch main can be used in place of a six-inch main)
- The flexibility of smaller MP plastic piping lends itself well to trenchless installations and takes up less underground space in a crowded urban environment
- Water intrusion is not an issue
- Excess flow valves can be used
- Smaller services can supply higher loads
- Customers have a greater choice of gas utilization equipment
- Gas systems are more easily segmented and repaired
- Plastic does not corrode
- Plastic does not have joints that are susceptible to leaks
- Plastics less subject to impact-induced cracks, compared with cast iron and ductile iron
- Plastics can experience ground movement with less likelihood of leakage.

#### b. Peoples Gas System Configuration

The Peoples Gas system operates primarily on a grid configuration. It employs 4,236 miles of main. Cast and ductile iron mains make up almost 40 percent (1,648 miles) of this total. The system includes piping that dates back to the 1800s. Peoples Gas identifies pre-1920 piping as the source of a disproportionately large share of maintenance work, as Figure 2.1 demonstrates.

**Figure C.1: Maintenance Activity by Main Vintage**



U.S. Government data shows that the 1,648 miles in the Peoples Gas system at the end of 2013 gave it the fourth largest inventory of cast and ductile iron mains in the country. This data comes from The U.S. Department of Transportation’s Pipeline and Hazardous Materials Safety Administration (PHMSA), which regulates and ensures the safe and secure movement of

hazardous materials to industry and consumers by all modes of transportation, including pipelines. The Peoples Gas inventory of cast and ductile iron mains, although comparatively very large, leaves it far from alone in facing the hazards that such materials create. Gas companies in many large cities share legacy mains dating back 100 years or more, when manufactured gas was the only available source.

Manufactured gas came from a process that made a flammable gas from coal, coke, or a special grade of oil. Difficulties in compressing manufactured gas meant locating production plants close to customers. Distribution systems for this gas operated at low pressures. Tars and liquids present as byproducts of the manufacturing process helped to protect the cast-iron mains then in use, coating them and sealing some of their joints. The liquids prevented some of the joints from “drying out,” which reduced leaks. The introduction of inexpensive natural gas via interstate pipelines after World War II led to the end of gas manufacturing. Drier pipeline gas, which also lacked other byproducts of manufactured gas, came to be delivered at high pressures, often over long distances to the communities whose customers used it. The changes in the characteristics of natural gas removed some of the natural protection that manufactured gas provided to cast-iron mains.

Three categories of legacy gas piping comprise particular sources of safety risk today (in Chicago and in many other large urban locations): cast iron, ductile iron, and bare steel. Peoples Gas has eliminated bare steel main from its gas system, but continues to use much of the other two types.

Figure C.2 uses 2013 PHMSA data to compare companies having 500 or more miles of cast iron and ductile iron combined. Only 18 of the country’s more than 1,400 gas utilities, including Peoples Gas, continue to employ this amount of cast and ductile iron pipe.

**Figure C.2: Utilities with >500 Miles of Cast and Ductile Iron Pipe**

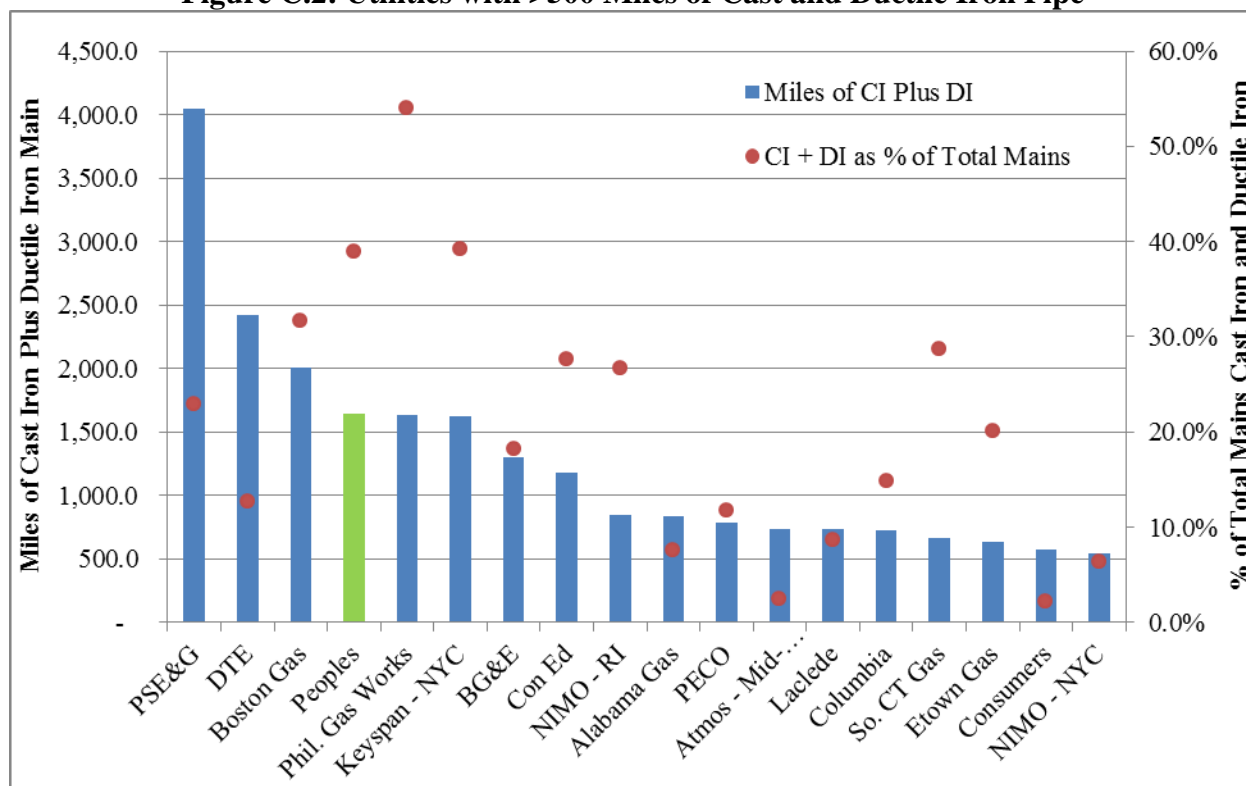


Figure C.3 shows that cast and ductile iron represent only minimal portions of the services on the Peoples Gas system. Unprotected steel and copper (also considered high risk) are more prevalent, but still at very low levels.

**Figure C.3: Gas Services by Material**

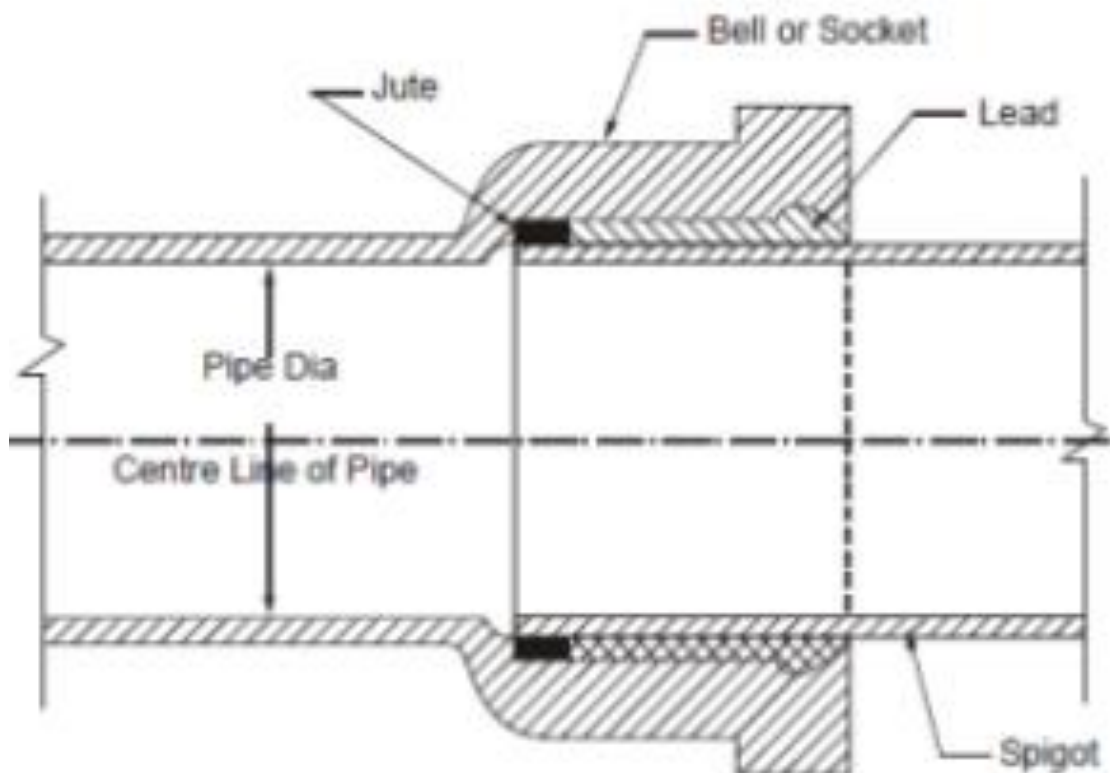
Material	Number	Percent
Unprotected Bare Steel	5,227	1.0
Unprotected Coated Steel	177	0.03
Cast Iron	72	0.01
Ductile Iron	275	0.05
Protected Coated Steel	42,591	8.3
Plastic	454,149	88.1
Copper	13,228	2.6
<b>Total</b>	<b>515,719</b>	<b>100</b>

### c. Cast and Ductile Iron Pipe Characteristics

Cast iron (CI) and ductile iron (DI) present great risk because their failures can prove both unpredictable and catastrophic in nature. Mains operating entirely leak free can suddenly fail, releasing large volumes of gas the same day the failure occurs. Both cast and ductile iron mains typically use bell and spigot joints (Figure 2.4 below), which are prone to failure. The bell side of such joints has a larger diameter than the pipe. The spigot end has the same diameter and often a

ridge. After connecting the two ends and applying sealing material (typically jute or oakum), lead (and on occasion cement) would be poured into the joint to lock the seal.

**Figure C.4: Bell and Spigot Joint**



Cast iron pipe tends to crack or break unpredictably. Ductile iron is more prone to breaking. Both types of failure can occur without the prior warnings that small leaks can give to utility operators in the cases of other materials. The unpredictability of catastrophic leaks makes managing their risks complex. Sudden failures and high volumes of resulting gas migration make all cast iron breaks and ductile iron breaks a major threat, particularly in densely populated, urban areas. For example, when stress on a pipe relieves (via the break), the pipe typically breaks entirely around its circumference, producing a large leak path for flowing gas to fill. Such a break can happen on a pipe producing no indication of gas leakage at all, perhaps only minutes earlier.

Cast and ductile iron pipe have posed leak threats for many decades, but accelerated replacement as a common solution has a more recent origin. Many urban utilities, as far back as the 1950s (and through the 1970s), patched leaks as they occurred, in lieu of the major endeavor that large-scale system replacement would entail. Continued aging of cast and ductile iron over the decades, however, has increased risks. Cast iron undergoes graphitization over time. Graphitization describes a natural process causing iron to degrade and weaken, making cast iron pipelines more susceptible to cracking.

Similar deterioration of ductile iron occurs. Graphitized mains fail comparatively readily when placed under stress. Joint repairs also lose effectiveness over time. Companies have commonly “joint repaired” cast and ductile iron joints many times over their lengthening lives. External and internal joint repairs buy time, but do not offer a permanent solution.

As a consequence, the industry has moved strongly in the direction of replacement, as opposed to continuing to “patch” aging iron infrastructure.

#### **d. Legacy Low Pressure Gas Systems**

At the same time, another legacy feature of older urban gas systems has come to affect strategies for dealing with aging mains. These urban systems typically operate at low pressure (typically ¼ psig). “Pounds per square inch gauge” measures a unit of pressure relative to atmospheric pressure at sea level, as opposed to pounds per square inch absolute (psia), which measures pressure relative to a vacuum. As compared with medium pressure systems typifying more modern configurations, they also entail a number of other safety (as well as operational and customer convenience) disadvantages:

- Proneness to failure modes described above
- Inability to employ excess flow valves
- Water infiltration
- Collapse when exposed to water main breaks (cast and ductile iron can collapse when undermined)
- Lack of ready shutoff capability in case of emergencies
- Excessively low pressures on cold days (due to insufficient capacity)
- Susceptibility to risks of over-pressuring the system
- Greater repair difficulty
- Lack of capacity to support system expansion
- Inability to support newer appliances
- Limited ability to allow expanded customer gas use. (e.g., larger boilers, back-up generation).

Thus, building infrastructure that supports operation at medium pressure has importance in addressing system infrastructure needs. Making the changes to support such operation, however, can require major system changes. Increasing the operating pressure of a gas system requires a major change of entire segments of the system to occur simultaneously. The legacy practice of replacing 6” (low pressure) pipe with the same size material and using the same comparatively short sections that repair needs require can continue to support reliability. It also looks economical, from a strictly “maintenance” perspective. However, it consigns a system to low pressure operation indefinitely. Thus, it becomes wise to consider the costs and benefits of a modernization program that is more expansive and expensive, particularly when facing, as Peoples Gas has, massive replacement needs for safety reasons. Specifically, that means consideration of wide-scale replacement work to increase system capability to medium pressure, while simultaneously addressing cast and ductile iron replacement.

### **e. Plastic Pipe's Advantages**

Advances in the use of plastic pipe since the late 1960s have been dramatic. Experience has led to the development of materials shown through experience and testing to suffer no significant deterioration as their lives progress. Typically gas distribution companies today use plastic as the preferred material of choice for new distribution gas piping wherever possible. Plastic can bring significant economies apart from its resistance to deterioration:

- 2" plastic pipe can replace legacy 6" pipe when main pressures are increased
- Trenchless installations use less space in crowded urban environments
- Smaller-diameter services can supply higher loads.

Plastic pipe also has operational advantages:

- Eliminates water intrusion as an issue
- Supports use of excess flow valves
- Supports easier segmentation and repair of gas systems when shut off valves are installed
- Eliminates all forms of corrosion
- Eliminates joints susceptible to leaks
- Eliminates tendency to crack upon impacts
- Increases ability to avoid leakage on ground movement.

### **f. Complementing an AMRP**

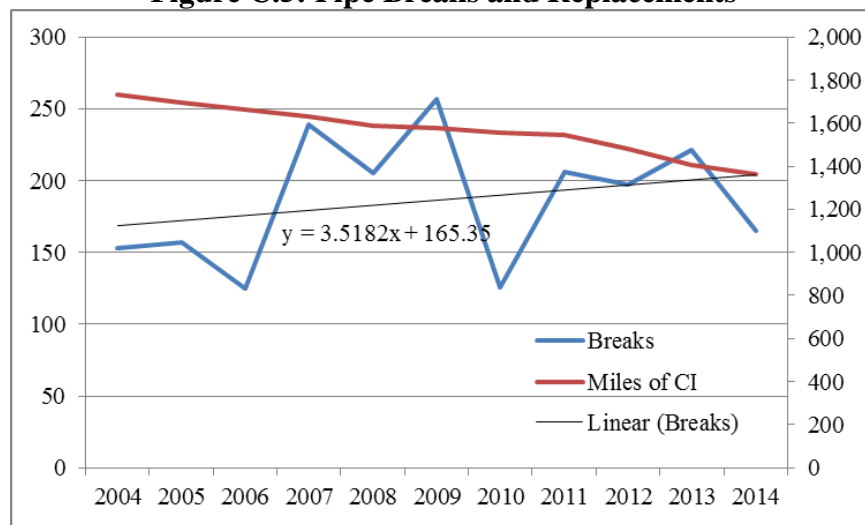
A comprehensive main replacement program can take decades to complete, even when carried out on an accelerated basis. In the meantime, safety risks can continue to grow on sectors or components awaiting replacement. Measures exist to address those risks, by taking work out of replacement plan order where indicated.

Peoples Gas addresses the need for priority (out-of-AMRP-order) cast and ductile iron replacement. It uses a risk tool to identify those mains with sufficiently high risk to justify immediate replacement, regardless of AMRP schedules. The Company's Main Ranking Index ("MRI") identifies those mains with a high likelihood of leakage. Peoples Gas seeks to replace in the immediate term those mains with an Index ranking of 6 or greater (5 or higher for mains in proximity to places of public assembly). Recently, Index-driven replacements amount to 1.5 miles per year. The Main Ranking Index has a long history at Peoples Gas, which has used it since 1993. Chapter F: Risk Assessment addresses its use in more detail. That chapter also discusses how it combines with the neighborhood (or zone) approach that Peoples Gas has recently adopted to combine pipe replacement with work seeking other operational and customer improvements (medium pressure grid operation and movement of indoor meters outside).

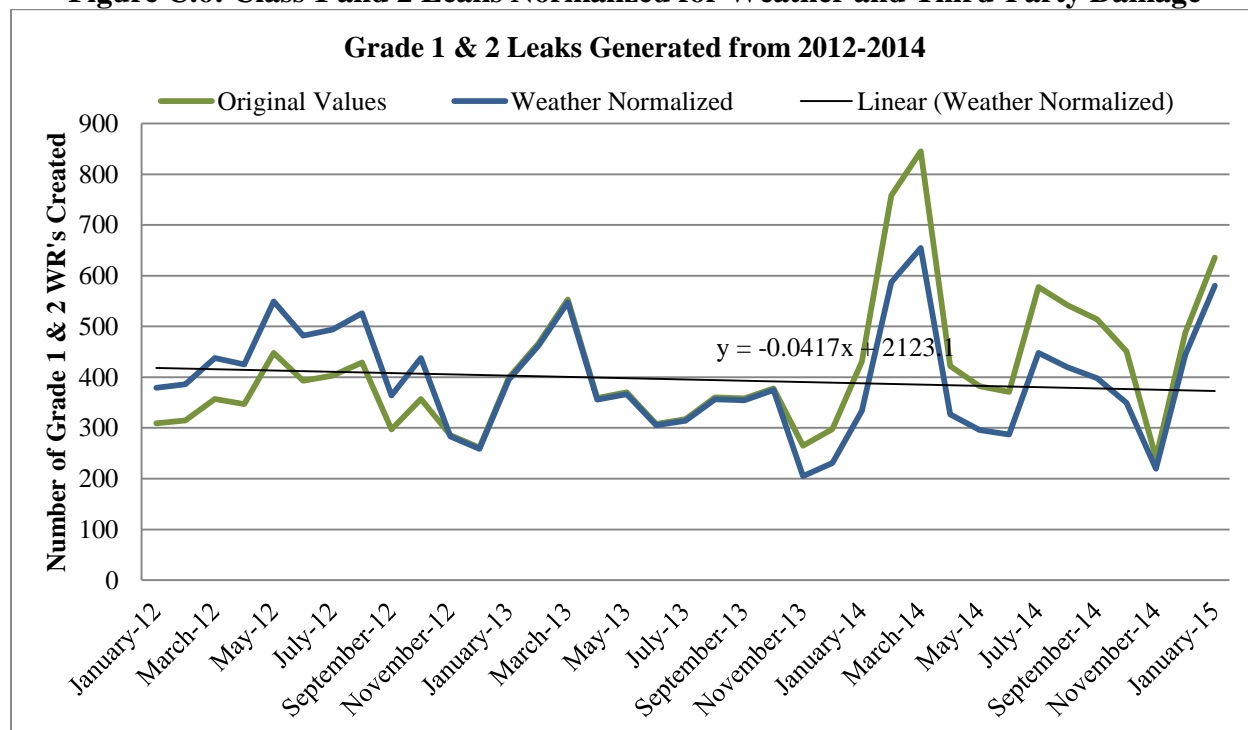
Conceptually, overlaying replacements driven by use of the Main Ranking Index onto the neighborhood approach makes sense. Chapter F discusses, however, how leak history trends reveal a need to examine the effectiveness of Peoples Gas' Index itself. Records show that replacements over the past 10 years have reduced the miles of cast and ductile iron in the system by some 350 miles (20 percent). Despite this decrease, the incidence of breaks has gone in the opposite direction, increasing by about 20 percent earlier in the period. Peoples Gas has presented leak rate changes after normalizing them for weather and third-party damage breaks. Even accepting those

adjustments, however, still produces a rate that, in recent years, has declined only very marginally. The rate of decline is less than an accelerated replacement program would be expected to produce. A break trend line that corresponds more closely to the changes in miles of at-risk mains would provide more reason for confidence that AMRP and Main Ranking Index driven replacements together are succeeding in removing risk at a suitable pace. Report Chapter F: Risk Assessment addresses means for optimizing the use of a conceptually effective replacement driver overlay (like the Main Ranking Index) to address immediately highest-risk pipe in the context of a program that combines safety with other drivers in identifying infrastructure improvement work.

**Figure C.5: Pipe Breaks and Replacements**



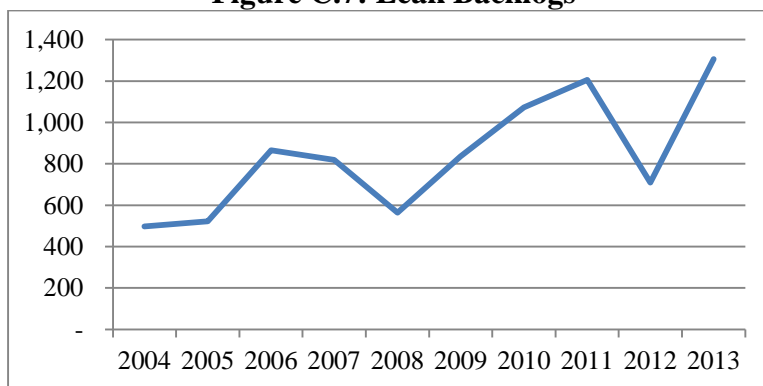
**Figure C.6: Class 1 and 2 Leaks Normalized for Weather and Third-Party Damage**



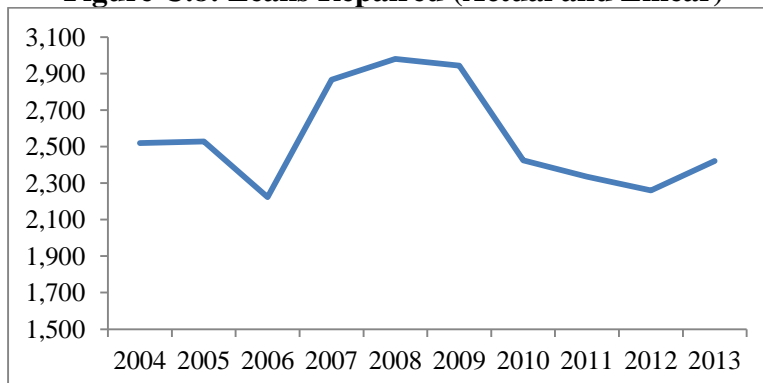
### g. Leak Management

Leak backlogs provide an important indicator of system safety. Gas distribution companies cannot cost efficiently repair all leaks on their systems. Ranking them in order of potential risk to persons or property typically guides decisions to repair them or, alternatively, to continue monitoring them for increasing risk. Small joint leaks, particularly in systems with high amounts of cast iron, can remain in place for many years. AMRP programs frequently place increased emphasis on monitoring versus replacement for segments on the program schedule. Figure C.7 shows an increase in leak backlog over the past 10 years. This rate far exceeds the more moderate level one could expect to accompany an AMRP. Over this same period, as Figure C.8 shows, the number of leaks actually repaired dropped moderately. These data show the need for careful examination of the methods by which Peoples Gas ranks pipe in replacement priority. Chapter F: Risk Assessment addresses those methods in detail.

**Figure C.7: Leak Backlogs**



**Figure C.8: Leaks Repaired (Actual and Linear)**



### h. Double Decking

Most cities use a single main down all but the widest streets to serve customers. Peoples Gas takes a different approach. It installs “double deck” mains; *i.e.*, runs one main down either side of each street. Each serves customers on its side of the street. Double decking thus can produce as much as twice the amount of main required to serve the same number of customers, when compared with the more prevalent approach. The significant increase in linear feet of work would appear at first glance to impose substantial cost disadvantages. Liberty inquired into the reasons for its use. Without double decking, a single main would serve customers on both sides of the street, requiring



services trenched across the street to reach such customers on the far side of the street. Street and paving issues, however, make installing double decking (with its use of the “parkways” or sidewalks paralleling streets) economical for Peoples Gas. It will also lessen the need for moving or protecting its facilities in cases of future infrastructure work by others occupying the streets.

### i. Other Safety and Reliability Considerations

As important as an AMRP is in ensuring public and employee safety, it must operate in tandem with other safety-focused activities. Moreover, as the neighborhood approach embodies, consideration of factors other than safety alone can provide opportunities to address other important considerations. Liberty examined a number of other safety and reliability considerations that in its experience have significant importance for systems like the one that Peoples Gas operates in the City of Chicago.

#### i. Contractor-Caused Damage

Contractor damages offer another measure of performance in gas distribution system protection. Peoples Gas has experienced contractor-caused damage counts approaching the highest among companies reporting to The Department of Transportation’s Pipeline and Hazardous Material Safety Administration (“PHMSA”). Further, among the one percent of companies having the highest number of contractor damages, Peoples Gas has the highest number of damages per 100 miles of main. Figure C.9 compares data for the 16 companies having the highest numbers of reported contractor damages. Peoples Gas observes that reporting differences serve to inflate its count relative to other reporting companies. Nevertheless, Liberty finds these counts extraordinarily high.

**Figure C.9: Companies with the Highest Numbers of Contractor Damages**

Company Name	Main Miles	2013 Damages		Company Name	Main Miles	2013 Damages	
		No.	Per 100 Miles			No.	Per 100 Miles
Centerpoint Energy	30986	3712	12	Consumers Energy	26466	1562	6
Atmos Energy - Mid-Tex	29594	2926	10	DTE Gas	18971	1196	6
Southern California Gas	49953	2603	5	Centerpoint Energy Resource	13592	1168	9
Northern Illinois Gas	32875	2253	7	Piedmont Natural Gas	15474	1113	7
Atlanta Gas Light	31414	2159	7	Ameren Illinois	16941	1092	6
Alabama Gas	11006	2043	19	Northern Indiana Public Service	16749	1052	6
Columbia Gas Of Ohio	19829	1881	9	Peoples Gas	4236	1043	25
Pacific Gas & Electric	42555	1811	4	Oklahoma Natural Gas Co.	17465	1032	6

#### ii. Maintaining Operating Pressure

Effective operation of a gas system requires analysis of how system conditions (*e.g.*, peak loads) will affect system operations. Peoples Gas uses industry-standard Stoner Analysis to analyze gas flows and pressures under a variety of assumptions. Addressing inadequate pressure comprises an important element in ensuring reliable service. Operating in areas that experience harsh winters underscores the importance of dealing with pressure issues. Peoples Gas does not give low pressure a place in its neighborhood priority rankings. Its analyses have indicated that 88 main segments would experience inadequate pressure during a peak hour.

*iii. Contingency Analysis*

Best practice calls for the use of contingency analyses to limit outage exposure. A typical output of a contingency analysis shows those system components whose failure would produce the highest number of customer outages by temperature brackets extending down to design day conditions (*i.e.*, the harshest considered in design). Peoples Gas does not consider this reliability criterion in prioritizing neighborhood work.

*iv. Operable Service Valves*

Counts of operable service valves also provide insight into the general health of a gas system. Peoples Gas does not employ such a metric. It does not perform operability audits.

*v. Pressure Testing*

At the time of Liberty's field work, Peoples Gas was testing medium pressure services at 50 psig and mains at 100 psig. The use of 50 psig conforms to present Company operating practices. However, industry practice includes testing both medium pressure services and mains at 100 psig. The practical significance of the Peoples Gas approach is that testing services at 50 psig limits the ability to upgrade them to 60 psig in the future. Being able to operate the gas distribution system at 60 psig would provide additional delivery capacity. This increase would improve the ability to increase supply in high use locations and to mitigate some low pressure issues during design day operation.

**j. System Statistics**

The appendix to this chapter charts the position of Peoples Gas relative to the group of 17 other U.S. gas utilities that have at least 500 combined miles of cast and ductile iron mains. The Company's position relative to the others on those charts is:

- Bare steel services: 2<sup>nd</sup> lowest
- Ductile iron services: highest (total of 294)
- Cast iron services: 4<sup>th</sup> highest
- Main corrosion leaks: 5<sup>th</sup> lowest
- Main material or weld failures: 6<sup>th</sup> highest.

**3. Conclusions**

**C.1 Peoples Gas has an overall sound knowledge of the numbers and locations of problematic mains and services.**

The inventory of problematic mains and services in the Peoples Gas territory consists of:

- 1,406 miles of Cast Iron main
- 242 miles of Ductile Iron main
- Small amount of poor quality plastic mains (Peoples Gas has quantity identified and located)
- 5,677 Unprotected bare steel services
- 180 Unprotected coated steel services
- 74 Cast Iron services

- 294 Ductile Iron services
- 13,824 Copper services (believed to be of lesser risk, but included)
- Small amount of poor quality plastic services.

The Peoples Gas main and service records locate these facilities. The infrastructure-based sources of highest risk in the Peoples Gas system consist generally of the presently targeted mains and services of the AMRP. The populations that present highest risk (subject to adjustment based on consideration of population to proximity) consist of:

- Existing ductile iron medium pressure mains and services
- Cast iron mains and services smaller than 12" that have been undermined or exposed to ground movement
- Cast iron mains and services of the smallest diameter (the smaller diameter, the higher the risk based on likelihood of breaking)
- Graphitized (weakened) cast iron mains and services
- Pre-1920 cast iron mains and services
- Poor quality plastic ("clear plastic") mains and services.

**C.2 Peoples Gas employs very high amounts of high-risk pipe in its system; a program to eliminate it on the accelerated basis contemplated by the AMRP remains and will in coming years remain a high priority contributor to public safety.**

Cast and ductile iron are recognized throughout the gas distribution industry as prone to high rates of failure. These facilities, which create major risks to public, customer and employee safety, comprise an unusually large portion of the Peoples Gas system. The 1,648 miles in the system at the end of 2013 (about 40 percent) give the Company the fourth largest inventory of cast and ductile iron main in the country. Moreover, despite a program of retirements that has existed (in various forms) for several decades, break rates remain high. Peoples Gas still has in place high-risk materials (unprotected steel, clear plastic, and copper) in its services, but they comprise very low percentages of totals in this category. These high-risk materials nevertheless continue to require attention in replacement program planning and execution.

These circumstances make continuation of accelerated replacement a matter of high public importance. Moreover, as Chapter F discusses, an examination of trends in replacements versus breaks warrants a focused examination of how the methods used to prioritize pipe for replacement function.

The high amounts of cast iron and ductile iron piping and the bare steel services remaining in the system create a significant safety risk for Peoples Gas, its customers, and the general public. The system faces a need for modernization as well. Accelerated retirement of the cast iron and ductile iron piping and bare steel services comports with good utility practices, and addresses first-priority safety needs.

**C.3 The benefits of transitioning to medium pressure operation on a wide scale and of moving inside meters to locations outside customer structures warrants a carefully managed combination of high-risk main replacement with work designed to produce those other benefits.**

A program like the AMRP will bring major customer service disruptions, however well planned and executed it may be. Combining it with the transition to a medium pressure system makes sense from a long-term operating perspective and in view of the added customer convenience and benefits it can produce. The neighborhood or zonal approach for doing so can optimize work efficiency.

Conceptually, the Peoples Gas utilization of a “neighborhood” approach with an overlay to address pipe in most critical need of replacement is sound. It promotes economy in serving a broader set of objectives, while focusing at the same time on reducing the safety threat risks posed by high-risk pipe. As Chapter F discusses, however, ensuring the optimal use of this overlay approach requires a revisiting of the criteria used in measuring risk and the weight given to them.

**C.4 Departing from the more typical approach of a single main to serve customers on both sides of the street makes sense under the conditions that Peoples Gas faces, but deploying the strategy without exception would not promote optimization. (*Recommendation C.1*)**

The “double decking” that Peoples Gas employs substantially increases some aspects of material and construction costs, but generally responds effectively to the cost penalties that would apply to the use of a single main (serving both sides of the street). A single main would require opening the paved portion of public rights-of-way, because the City of Chicago will not allow directional drilling of services under the street. A separate main serving each side of the street also offers future advantages (*e.g.*, avoiding disruptions when future in-street work by others takes place). Finally, minimizing work in the streets mitigates the amount of public disruption that a program as massive as the AMRP inevitably must produce.

The Company, however, should not conclude that new, double decking makes more sense in all cases. Examining particular circumstances of each street as part of neighborhood work planning, rather than a universally applied rule, should dictate the final choice. For example, it would appear likely that some existing center-of-the street mains can remain in place, while being upgraded to higher pressure. A 6” replacement project performed in 2006, but left to operate at low pressure offers a case that would merit consideration. It takes case-by-case analysis to determine whether doing so would prove more expensive than replacement again with double-decked pipe.

**C.5 A number of other safety, reliability, and testing issues need to be considered in conjunction with or on top of current Peoples Gas practices in AMRP planning or execution. (*Recommendations C.2, C.3, C.4, and C.5*)**

Peoples Gas experiences an extraordinarily high rate of contractor-caused damage counts. The Company expresses a high degree of confidence that: (a) reporting distinctions account for its high numbers compared to those of others, and (b) it operates effective prevention and mitigation programs to address such damage. Replacement due to pipe condition, not third-party damage, comprises the scope of this engagement. Therefore, Liberty has not examined the validity of these

two Company observations. However, confusion in break and repair numbers reported in Chapter F of this report and recognition that contractor damage presents both large safety risk and high costs warrant mention of this issue. The number of damage counts warrants attention by Peoples Gas and their causes need improved transparency to the Illinois Commerce Commission.

Similarly ensuring the operability of service valves has important safety and operations implications. The lack of a structured program for assessing operability does not conform to good utility practice.

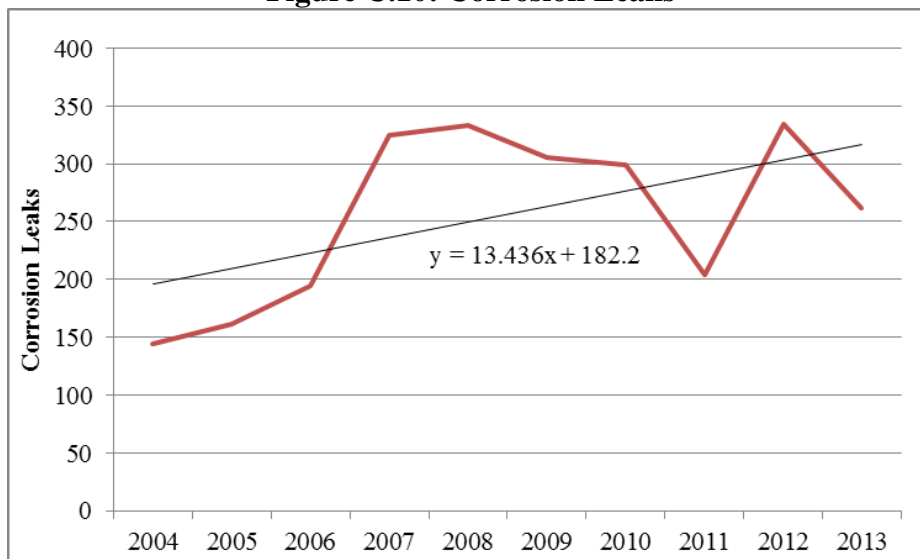
Addressing system weaknesses identified through analysis of operating pressure and of single contingencies that can produce widespread outages comprise key elements in ensuring the provision of reliable and adequate services. The work being done under the neighborhood construct has the potential for resolving pressure and single-contingency issues, but it is not clear that Peoples Gas considers those issues directly in planning.

Limiting testing to current operating pressures on systems that generally should support operation at higher pressure unnecessarily constrains possible future upgrades, considering the difference in test requirements to verify operability at higher pressure.

#### **C.6 Peoples Gas reports a number of corrosion leaks that do not comport with materials common in its system. (*Recommendation C.6*)**

Peoples Gas reports no bare steel main, but does report corrosion leaks. One would not expect reporting of leaks on plastic, cast iron or ductile iron to use corrosion as the classification. Liberty thus interprets the reported corrosion leaks as coming on bare steel services or on protected coated steel mains/services. The number of corrosion leaks shown in Figure C.10 causes concern. Peoples Gas believes that some of these corrosion leaks comprise pitting on cast iron, not cathodically protected steel mains.

**Figure C.10: Corrosion Leaks**



Another concern is that Peoples Gas reports 104 corrosion leaks on mains. Unless reasoned otherwise by Peoples Gas, this observation means that Peoples Gas' protected coated mains are corroding. The industry does not usually experience a significant number of corrosion leaks on protected coated steel main, nor does the industry typically classify leaks on cast or ductile iron as corrosion. Graphitization is a form of cast iron corrosion; however, it is unusual for gas distribution companies to classify leaks on cast iron as corrosion.

## **4. Recommendations**

### **C.1 Peoples Gas should include as an element of the neighborhood work planning process an evaluation of the merits of taking an exception to the double decking approach. (Conclusion C.4)**

Double decking as a default option clearly makes sense for Peoples Gas. The planning process, however, needs to include an element that verifies its superiority over other options in individual cases.

### **C.2 Peoples Gas should more thoroughly study and report on the causes of extremely high reports of contactor damage incidents. (Conclusion C.5)**

The Company should perform a structured and analytically-based study of the cause and the safety risks imposed by contractor-caused damage. It should complete such a study within six months, and report its results to the Illinois Commerce Commission. The study should incorporate any proposed changes to prevention and mitigation efforts.

### **C.3 Peoples Gas should undertake measures to verify the operability of external service shutoff valves. (Conclusion C.5)**

Peoples Gas should also institute a program designed to determine the locatability and functionality of existing external service shutoff valves. Liberty specifically recommends a random survey of 1,000 services believed to be controllable through outside shutoffs. The survey should only include areas not scheduled for near-term neighborhood work under the AMRP. Should the survey identify location or operability problems with more than 10 percent of the services surveyed, Peoples Gas should expand the survey size to 5,000 services. If surveying identifies more than a small number of valves as not findable or not operable, then Peoples Gas should define, resource, and carry out a corrective action program.

### **C.4 Peoples Gas should examine the ability to address low pressure and single-contingency outage risks in the neighborhood program. (Conclusion C.5)**

Peoples Gas should conduct a structured analysis of where low operating pressure and single contingency outage threats exist and match those locations to neighborhoods planned for work in the near term. To the extent that these two threats prove material in any neighborhood, Peoples Gas should consider the benefits of addressing them more promptly by moving the neighborhood involved up in priority order.

**C.5 Peoples Gas should test both services and mains to 100 psig. (*Conclusion C.5*)**

Peoples Gas should test both service and main pressures to 100 psig on all new installations and develop methods to retest previously installed services to 100 psig, to give the system the ability to operate at a higher pressure in the future.

**C.6 Analyze and report on the precise nature and numbers of corrosion leaks, and determine whether protected and coated steel mains are experiencing corrosion leaks. (*Conclusion C.6*)**

Reporting problems may explain anomalous data about corrosion leaks. In any event, Peoples Gas needs to verify sources of leaks in order to properly assess needed responses.

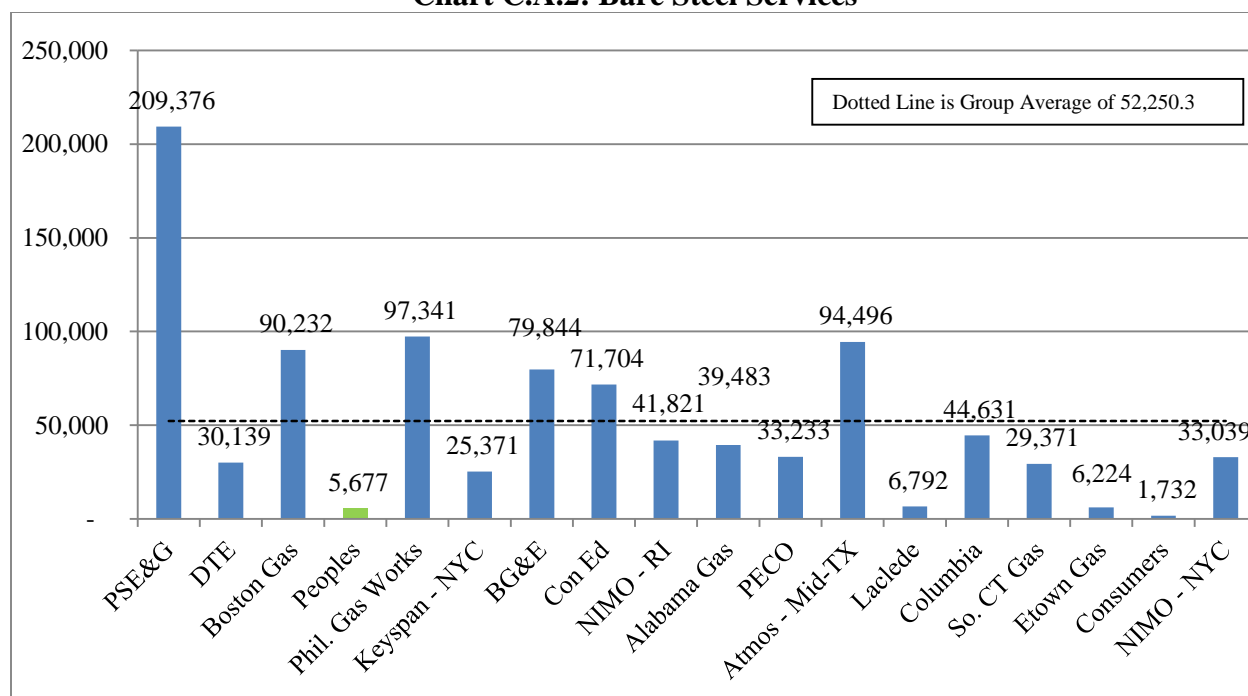
## **Chapter C Appendix: Comparisons with Companies Having >500 Combined Miles of Cast and Ductile Iron Main**



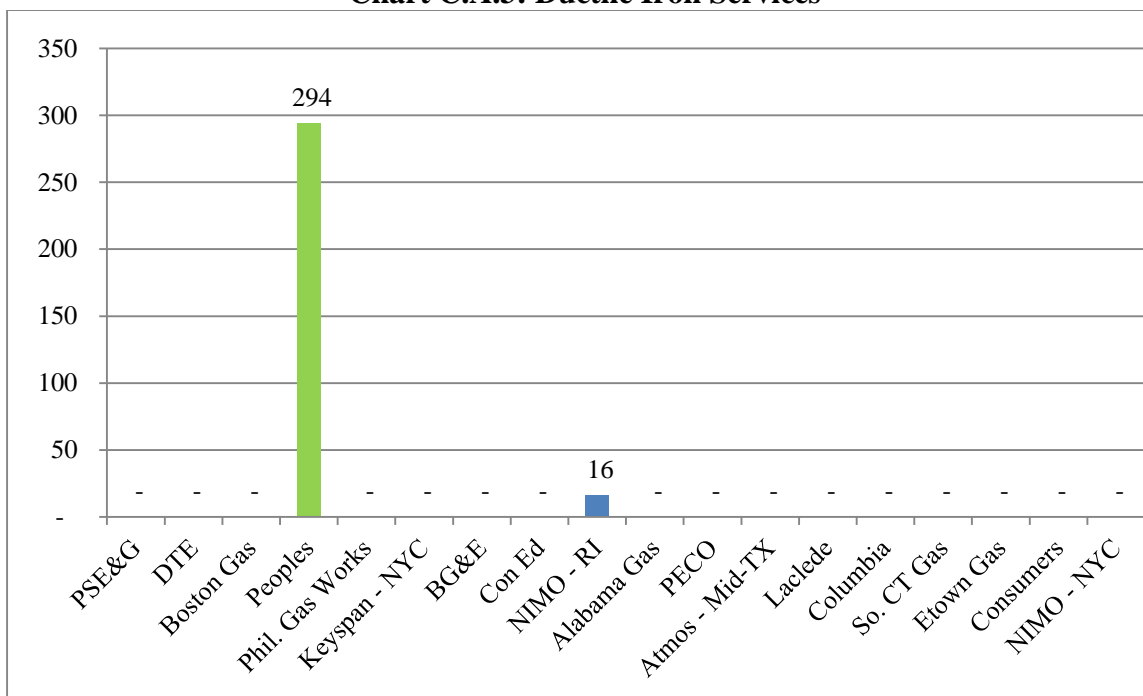
**Chart C.A.1: Unaccounted for Gas**

Utility Name	Miles of CI Plus DI	CI + DI as % of Total Mains	Number of Bare Steel Services	Number of Cast Iron Services	Number of Ductile Iron Services	Corrosion Leaks - Mains	Percent Unaccounted for Gas	Material or Weld Failures - Mains
PSE&G	4,051.0	22.9%	209,376	-	-	457	0.5%	30
DTE	2,419.3	12.8%	30,139	17	-	5,036	0.8%	72
Boston Gas	2,004.7	31.7%	90,232	1,549	-	726	4.0%	32
<b>Peoples</b>	<b>1,648.2</b>	<b>38.9%</b>	<b>5,677</b>	<b>74</b>	<b>294</b>	<b>104</b>	<b>2.9%</b>	<b>67</b>
Phil. Gas Works	1,633.0	54.0%	97,341	-	-	146	1.2%	2
Keyspan - NYC	1,622.0	39.2%	25,371	-	-	101	3.4%	1
BG&E	1,298.0	18.2%	79,844	-	-	383	1.0%	98
Con Ed	1,177.0	27.6%	71,704	-	-	1,516	2.8%	30
NIMO - RI	847.3	26.7%	41,821	185	16	228	3.4%	3
Alabama Gas	834.4	7.6%	39,483	13	-	952	2.3%	419
PECO	790.7	11.7%	33,233	-	-	3,417	3.1%	35
Atmos - Mid-TX	737.0	2.5%	94,496	-	-	1,066	2.2%	443
Laclede	735.0	8.6%	6,792	-	-	466	4.2%	20
Columbia	723.9	14.8%	44,631	-	-	369	1.6%	209
So. CT Gas	668.4	28.7%	29,371	-	-	40	2.1%	19
Etown Gas	634.2	20.1%	6,224	-	-	68	1.9%	21
Consumers	575.2	2.2%	1,732	-	-	262	0.9%	2
NIMO - NYC	547.6	6.4%	33,039	1,600	-	59	0.8%	9
<b>Peoples Gas Rank</b>	<b>4</b>	<b>3</b>	<b>17</b>	<b>4</b>	<b>1</b>	<b>14</b>	<b>6</b>	<b>6</b>
<b>Average</b>	1,274.83	0.21	52,250.33	191.00	17.22	855.33	0.02	84.00
<b>Median</b>	840.86	0.19	36,358.00	-	-	376.00	0.02	30.00
<b>25th Percentile</b>	726.66	0.09	26,371.00	-	-	114.50	0.01	11.50
<b>75th Percentile</b>	1,630.25	0.28	77,809.00	16.00	-	895.50	0.03	70.75

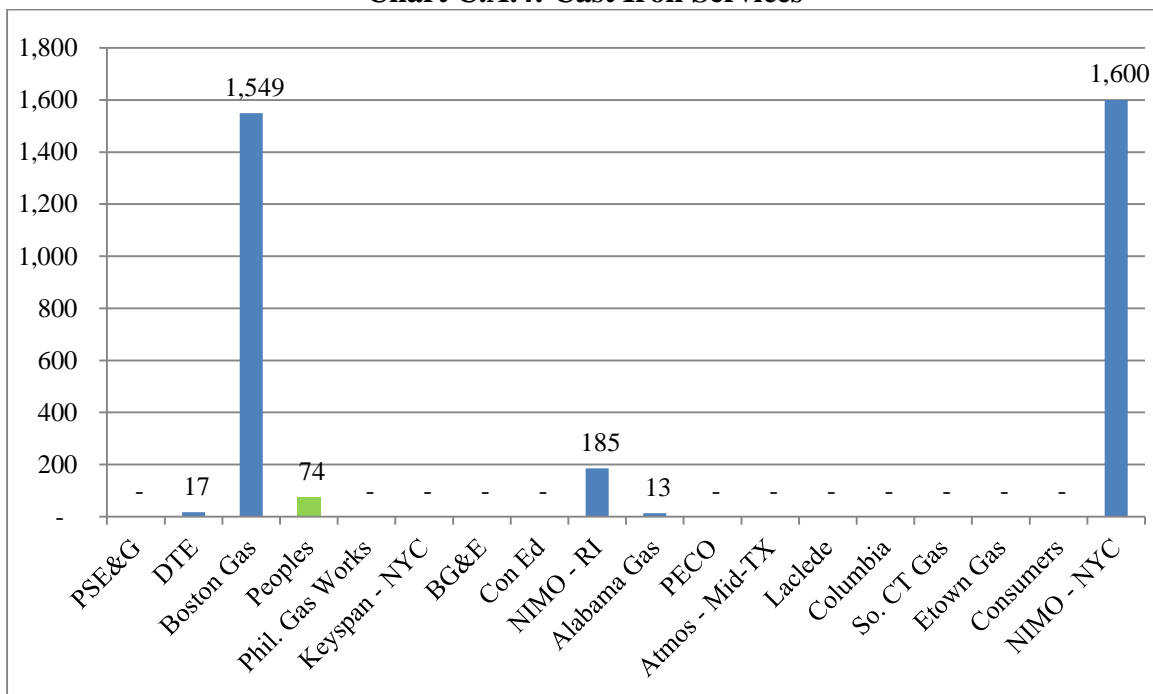
Chart C.A.2: Bare Steel Services



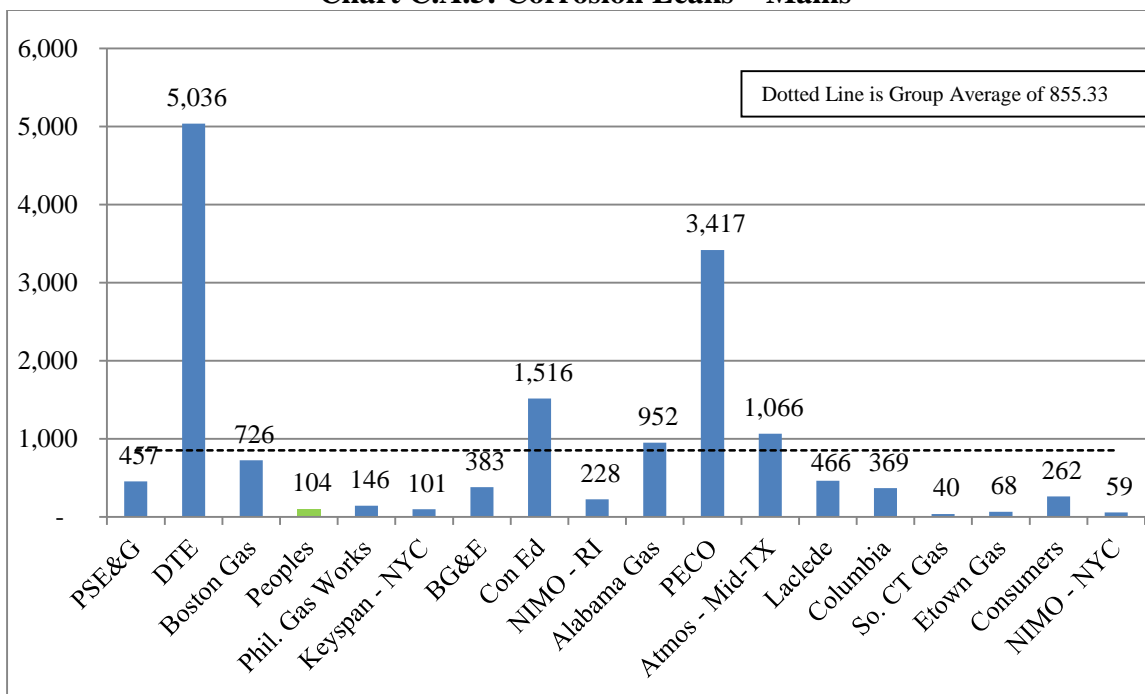
**Chart C.A.3: Ductile Iron Services**



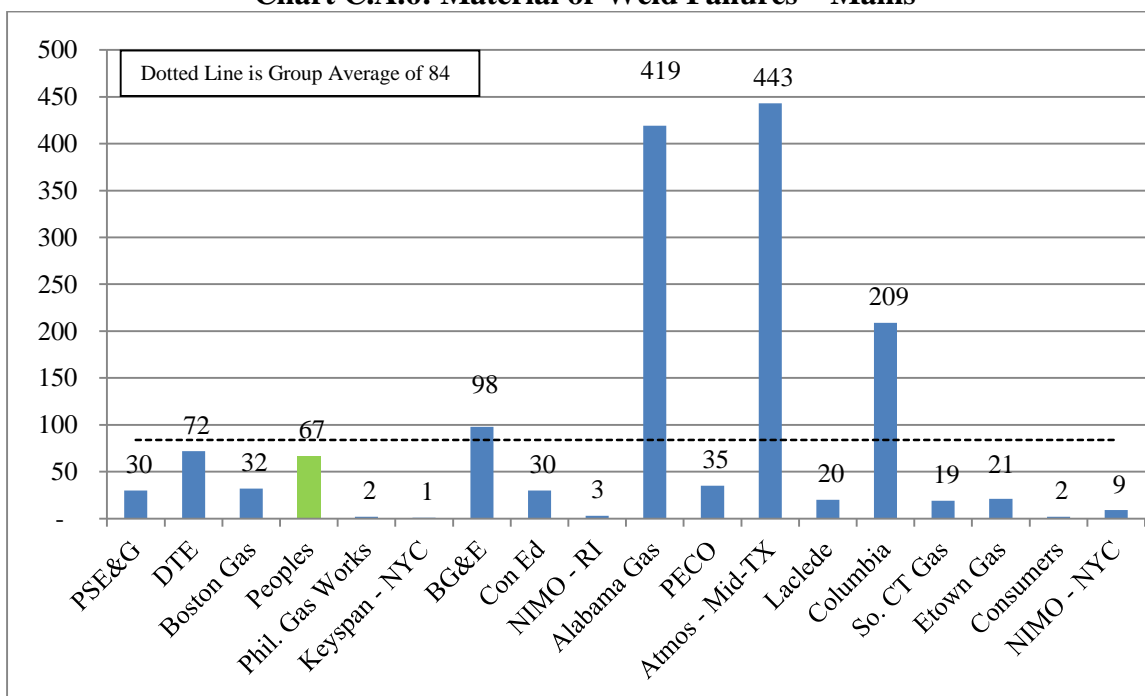
**Chart C.A.4: Cast Iron Services**



**Chart C.A.5: Corrosion Leaks – Mains**



**Chart C.A.6: Material or Weld Failures – Mains**



## *Chapter D Table of Contents*

Chapter D: Definition and Current Status of the AMRP .....	D-1
1. Background .....	D-1
2. Findings.....	D-1
a. Early AMRP Years .....	D-1
b. Defining the AMRP .....	D-1
c. The Challenges in Measuring Production Performance .....	D-3
d. Production History .....	D-4
e. Analysis of Historical Production .....	D-7
f. AMRP Production.....	D-9
g. Cost and Productivity Performance .....	D-14
h. The Plan and List of Projects .....	D-15
i. Company Analyses and Corrective Actions .....	D-16
j. Comparisons with Similarly-Situated Companies .....	D-16
3. Conclusions.....	D-16
4. Recommendations .....	D-19
Chapter D Appendix: 20-Year Plan (Neighborhood Plan Range).....	D-21

## Chapter D: Definition and Current Status of the AMRP

### 1. Background

This chapter:

- Discusses AMRP scope, plan, and execution structure
- Describes the individual projects that collectively define the AMRP
- Addresses Liberty's review of reported AMRP progress to date, including comparisons to initial plans and expectations
- Analyzes trends of the first few program years
- Discusses their potential long-term ramifications.

The AMRP comprises a 20-year multi-billion dollar initiative. Such a program calls for a definitive plan and clearly reported progress versus that plan. Liberty examined the subjects of plan and progress measurement with respect to program scope, production, costs, and schedules. These four elements form fundamental building blocks needed to build and manage a program of the size and scope of the AMRP. Program management cannot prove effective when these attributes are unknown, confused, inconsistent, or wrong. A simplistic but essential notion, *i.e.*; “you can’t manage what you can’t measure,” underlies each element. We expected to find consistent and accurate data, not because this audit required it, but because effective AMRP management requires it.

### 2. Findings

#### a. Early AMRP Years

Peoples Gas has replaced leak-prone pipe for many years. What changed recently is the introduction of a substantially accelerated effort, debated and approved in 2009, with physical work starting in earnest in 2011. The continuity of the program underwent disruption in late 2011 when the cost recovery mechanism was found to be inappropriate. A new cost recovery mechanism, implemented in 2013, reestablished assurances that funding would be available for the AMRP.

In hindsight, this temporary disruption, in the context of a 20-year effort, may seem small. However, it led to major impacts on the AMRP. It might have led to re-planning, but that did not happen. The time between changes in rate recovery mechanisms did not generate a comprehensive and consistent approach to the AMRP. Thus, the program’s formative stage did not produce the strong foundation one would expect as a massive, long-term program ramps up to a steady state. To the contrary, some positive first steps appear to have been lost.

#### b. Defining the AMRP

Liberty began its review with the expectation that a multi-billion dollar and multi-decade program would be well defined. That expectation proved incorrect. Early work, however, disclosed significant barriers in forming descriptions of program scope and the nature of the Company’s commitments. It became clear that some important questions about AMRP definition did not have direct answers.

A first example of the “fuzziness” arise from placing AMRP and non-AMRP work under common program management. The approach makes sense from a management perspective, but the homogenization of AMRP into something larger makes it impracticable to capture data specific only to the AMRP. It was not clear that data presented on project progress included only AMRP work, or, instead, represented the combined scope of the program management organization responsible for both. During interviews with Liberty, Company personnel did not have the ability to offer AMRP-focused information. In September 2014, the Company reported that “information provided to Liberty that was created during and after the first quarter of 2014 was QIP focused”. This Qualifying Infrastructure Plant Surcharge addresses rate recovery of work that includes, but is not limited to, AMRP projects.

A second factor complicates determining the AMRP’s scope clearly. This factor exemplifies the difficulty in isolating the AMRP from work directed at other important needs. Peoples Gas lays out projects associated with the AMRP over a 20-year period. From time-to-time, it becomes necessary and desirable to execute projects significantly earlier in the schedule. Municipal public improvement projects occasionally cause the Company to complete some AMRP projects well before long-term plans would indicate. Responding to such public needs as they arise reflects a straightforward and logical approach, but has bred confusion about whether or not such work actually comprises part of the AMRP.

Replacement work originally planned as part of the AMRP’s scope and the quantities installed should undergo collection and reporting distinctly as part of AMRP program results. Early Liberty interviews identified public improvements as a source of scope confusion. Months after conducting them, however, a request for installed and retired AMRP quantities produced a February 20, 2015 response that:

*“The quantities for AMRP main installed, main retired, and services installed do not include Public Improvement projects. Total AMRP expenditures, budgeted and actual, include Public Improvement projects”.* [Emphasis added]

A third example of the difficulty in clearly defining the boundaries of AMRP scope came through interviews with senior Company personnel. Liberty frequently sought to determine what documents expressed clear commitment to a 20-year AMRP. The responses generally avoided direct acknowledgement of the existence of the commitment, accompanied by assertions that no document imposes it. As a result, Liberty concluded that those responsible for managing the program could not find themselves able to subscribe to a fundamental parameter of the Company’s commitment. In fact, Peoples Gas itself had stated in its original Project Execution Plan that:

*Peoples Gas Light and Coke Company has typically replaced 40 to 50 miles of gas mains per year throughout the City of Chicago. Replacement of the remainder of the low-pressure distribution system as well as the medium pressure cast iron and ductile iron mains will be replaced with medium-pressure plastic and cathodically protected steel pipe over 20 years.*

The hedging nature of the interview statements apparently derived from the notion that this commitment, written in 2011, occurred under a different regulatory recovery scheme, and might no longer be appropriate, in their opinion.

These observations illustrate the need for careful attention in evaluating AMRP statistics and in relating them to long term objectives. It makes sense to manage the work on a common, homogenized basis. The integrity of AMRP reporting, however must remain distinct and transparent. The AMRP responds to critical public needs and expectations. The primary importance of those needs and expectations requires precise and complete reporting against the commitments that the AMRP addresses. Combined management must not lead to a combined reporting structure that diminishes the transparency of performance measurements specific to the AMRP.

### **c. The Challenges in Measuring Production Performance**

Gathering AMRP production data should prove fairly straightforward. Effective program management and control depend on a comprehensive set of data from which the rates and effectiveness of performance against plans, schedules, and budgets can routinely undergo examination, analysis, and response by management. It proved, however, difficult to gather meaningful production data. Liberty found that Peoples Gas was not collecting data in a manner that makes detailed information readily available.

It has proven very challenging to gather statistics that profile main replacement progress over the years on a sufficiently comprehensive, detailed basis. Liberty asked for these statistics in repeated data requests, and discussed replacement progress during many interviews. However, data that Peoples Gas provided to date has been incomplete and difficult to reconcile. Liberty has secured information that permits identification of overall indicators of progress. Later sections of this chapter discuss those indicators. However, the quality, scope, and depth of information necessary for tight control and effective management of the massive and complex AMRP program were not available.

The scope of this chapter calls for the presentation and analysis of numbers (*e.g.*, how many miles of pipe, numbers of services, and number of meters included in the AMRP and how many have been completed so far). The reporting and analysis provided by Peoples Gas, however, limits the quality of numbers reporting. The following discussion of the history of installed and retired pipe exemplifies those limits. The table presented below provides the basis for the discussion that follows. Its construction required three different information sources and a great deal of effort to use the data. The nature and quality of data that Peoples Gas collected and reported to Liberty requires the use of multiple information sources to produce even rudimentary understanding of AMRP program progress.

Peoples Gas says that it has recognized the problem, and that it is has committed to retaining, reporting, and analyzing data on a more effective basis. In the meantime, Liberty prepared this chapter with the best information available.



**Table D.1: Miles of Cast and Ductile Iron Installed and Retired**

Miles of Main (Cast Iron & Ductile Iron)										
	1980	1981	1982	1983	1984	1985	1986	1987	1988	1989
Installed			92	13	74	16	90	75	67	97
Retired		59	57	84	78	83	81	85	62	84
	1990	1991	1992	1993	1994	1995	1996	1997	1998	1999
Installed	85	94	78	58	48	57	43	33	124	-68
Retired	60	101	74	69	47	51	62	42	27	29
	2000	2001	2002	2003	2004	2005	2006	2007	2008	2009
Installed	48	66	55	46	43	62	58	53	80	35
Retired	36	46	7	60	33	32	39	49	46	12
	2010	2011	2012	2013	2014*	2015*	2016*	2017*	2018*	Total
Installed	99	-22	136	220	148	114	127			2,055
Retired	24	19	86	92	112	73	87			1,818
	PHMSA data (this document)									
	Estimated in AMRP project detail; pg 208, DR 62 - future work 2015 and 2016 project total estimates									
	PHMSA website									
	Keifner Chart									
	1980 PHMSA Report Missing									
	1982 PHMSA Report Missing									
	1983 PHMSA Data looks Incomplete									

#### d. Production History

Major public safety issues motivated AMRP creation. The priority of eliminating the most dangerous pipe should be, and has been, paramount throughout the historical efforts to mitigate public safety risks. Peoples Gas began its cast and ductile iron main replacement program in 1981. In that year, cast and ductile iron main represented 86 percent of the total system (3,450 of 4,031 miles of distribution system main). The Company established the program largely in response to a study concluding it would be reasonable to replace cast and ductile iron main by 2050.

Peoples Gas' main replacement approach from the early 1980s until 1993 targeted gas main segments based on vintage, diameter (primarily 4" and 6" pipe), and soil conditions. Recommendations of an outside firm led Peoples Gas to target main buried in clay, considering it more corrosive than other soils in the service territory. The Company retired an average of 77 miles of cast iron and ductile iron main each year from 1981 to 1993.

Peoples Gas established in 1993 a method for identifying poor performing main segments. This Uniform Main Ranking Index supports identification of segments using installation year, operating pressure, pipe diameter, and pipe material. The Company normalizes data to one city block for evaluation purposes. Risk ranking criteria consider breaks, cracks at taps, pipe wall thickness, visual observation, and incidence of leaks and other repairs. Each criterion has a multiplication factor based on "Break Equivalents" which is then multiplied by the number of occurrences.

A 1993 follow-up outside engineering study led the Company to determine that clay soil actually was not more corrosive than other soils. Peoples Gas then shifted replacement and retirement priorities to the riskiest segments of main, as defined by a Uniform Main Ranking Index value equal to or greater than 6. This change produced identification of many potential replacement

projects scattered across Peoples Gas' territory. Peoples Gas used its field shop employees' first-hand knowledge of pipe-segment maintenance and leak rates to prioritize replacement projects further. The Company divided responsibility for its various field operations into three geographically arranged "Shops."

Peoples Gas modified this "Bang for the Buck" approach in 1996. The Company began to introduce two additional ranking factors; *i.e.*, risk ranking of main segments and public improvement project needs. Renaming its efforts the "Capital Optimization Program," Peoples Gas began to identify poorly performing gas main segments using a method based on maintenance history. During the period of 1994 to 2005 the Company retired, on average, 42 miles of cast iron and ductile iron main annually.

From 2005 through 2008, Peoples Gas targeted for replacement those main segments that offered the greatest reduction in future operation and maintenance expenses or uncollectible accounts relative to the cost of the replacement. The Company manages moving inside meters to outside locations in conjunction with the AMRP. Peoples Gas expected these moves to lower uncollectible accounts by facilitating meter-reading and service shut-offs for delinquency. On average, Peoples Gas retired 46 miles of cast iron and ductile iron each year from 2005 through 2008.

In 2006, Kiefner & Associates conducted a study of the system's cast iron and ductile iron facilities. The study concluded that the Main Ranking Index appeared to be ranking gas main segments appropriately, based on prior maintenance history. The study recommended a staggered retirement approach, based on pipe size and thickness, and focusing on replacing smaller pipe first. Such pipe is generally considered more susceptible to breaks and cracks.

The Illinois Commerce Commission approved acceleration of cast and ductile iron main replacement and related cost recovery in the 2009 Peoples Gas rate case. By the end of 2009, the percentage of cast iron and ductile iron main in Peoples Gas' distribution system had been reduced to 46 percent (1,870 miles of cast iron and ductile iron main out of a total 4,086 miles of mains).

Peoples Gas began planning the AMRP in 2010, while it continued the existing annual cast iron and ductile iron replacement program. In 2009 and 2010, Peoples Gas ramped up to begin execution of the AMRP. Efforts focused on putting into place the resources to support the program. The Company, however, significantly curtailed its level of capital spending for main replacement in response to the nationwide 2008 financial crisis and continuing economic uncertainty. Peoples Gas retired a total of only 40 miles of main in 2009 and 2010.

A 2011-2012 AMRP Construction Strategy White Paper documents the criteria for selecting construction projects during the first two years of the 20-year AMRP. These criteria included:

- Illinois Commerce Commission commitments
- Areas where leak history indicated a need for attention
- Availability in the short term of Company and contractor labor resources
- Presence of infrastructure in place to support medium pressure system
- The likelihood of Public Improvement Projects within the two-year period
- The application of the Peoples Gas Main Ranking System.

Commitments made to the Illinois Commerce Commission prior to AMRP address general safety concerns; *e.g.*:

- Replacing all main segments within one year of reaching or exceeding a replacement index value of 6.0, regardless of location
- Replacing within one year of reaching or exceeding a replacement index value of 5.0 all main segments that lie adjacent to schools, hospitals and nursing homes
- Replacing medium pressure ductile iron (AMRP) segments by the end of 2013
- Targeting replacement of cast and ductile iron main in the North District
- Replacing ductile iron, copper, and bare steel service pipes adjacent to schools, hospitals and nursing homes by the end of 2011
- Replacing bare steel main by 2018
- Downsizing 15 high-maintenance “at risk” vaults annually.

Peoples Gas targeted the segments of main that satisfied these criteria in the first two AMRP years. This approach caused a scattering of replacement work, in order to address “hot spots” across the service territory. By the end of 2012, Peoples Gas’ replacement program had addressed most of the projects identified through application of the Uniform Main Replacement Index criteria.

In 2011, the first year of AMRP, Peoples Gas installed 155 miles of new mains in the 2011 project year. Several factors affected construction during the 2011 project year:

- Peoples Gas awarded construction bids for 2011 late in the year; the Company did not award some 2011 project work until 2012.
- Peoples Gas chose to be aggressive during the first construction year, hoping to build momentum quickly, instead of ramping up over the five-year period its contractor, Jacobs Engineering, recommended. This approach made it difficult for other stakeholders (*e.g.*, Peoples Gas Shops, City, city and state transportation officials) to accommodate the sudden increase in workload.
- Permitting processes delayed construction, given the increased volume of requests by Peoples Gas to the City and changing City requirements.
- Peoples Gas experienced increased coordination needs with respect to public improvement efforts to minimize disruption.
- Contractors were no longer able to bore under streets due to cross-bore regulations; they moved to open-cutting which lengthened project completion times.
- Peoples Gas had not communicated AMRP needs to affected customers during 2011; the Company therefore at the end of 2011 had many “stragglers” still attached to the old main, thereby prolonging retirements after replacement of that old main.

Retirement of a segment of old main cannot occur until: (a) installation of all service pipes onto the new main, (b) installation of meters and regulators at customers’ premises, (c) gassing of the new main, (d) transfer of all customers, and (e) degassing of the old main. These requirements impose a natural lag time between crediting of new main installation and of old main retirement. However, Peoples Gas focused primarily on getting as much pipe in the ground as possible during the AMRP’s first year. Retirement and restoration comprised a lower priority. Peoples Gas therefore retired only 19 miles of cast and ductile iron main in 2011.

Peoples Gas adopted a neighborhood-based approach to main replacement during 2013. This approach divides the system into 228 neighborhood areas. The Company created a spreadsheet model to rank the neighborhoods in terms of replacement priority. People's Five-Year Construction Plan forms the basis for neighborhood selection and phasing of the work. This plan undergoes annual updates. In addition to neighborhood ranking, the plan attempts to:

- Balance workload across Peoples Gas' three regionally-aligned shops
- Address needs and issues of aldermen representing the needs of their constituents
- Install sufficient high-pressure facilities to support the transition to medium pressure for the distribution system as a whole
- Support the City's current focus on accelerating replacement of water and sewer infrastructure and other public improvement projects
- Coordinate with other utilities and the City's paving program.

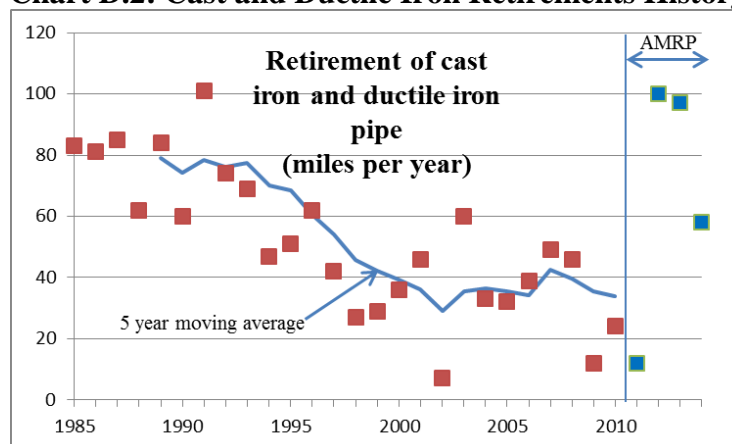
This approach continued for 2014, and comprises the planned approach for the next five years. It permits Peoples Gas to shift priorities within the five-year plan in response to the main ranking index scores, the City's needs, and other needs.

From 1981 until AMRP start, Peoples Gas replaced 1,371 miles of cast and ductile iron pipe on the system. The program assumes retiring approximately 100 miles of distribution main per year for the next 16 years to complete the AMRP. The difference between retirements and installations has significance in measuring AMRP performance. Amounts of high-risk main retired, not the amount of new main required to replace it, constitutes an important safety risk reduction metric.

#### e. Analysis of Historical Production

The next chart summarizes main retirements since 1985.

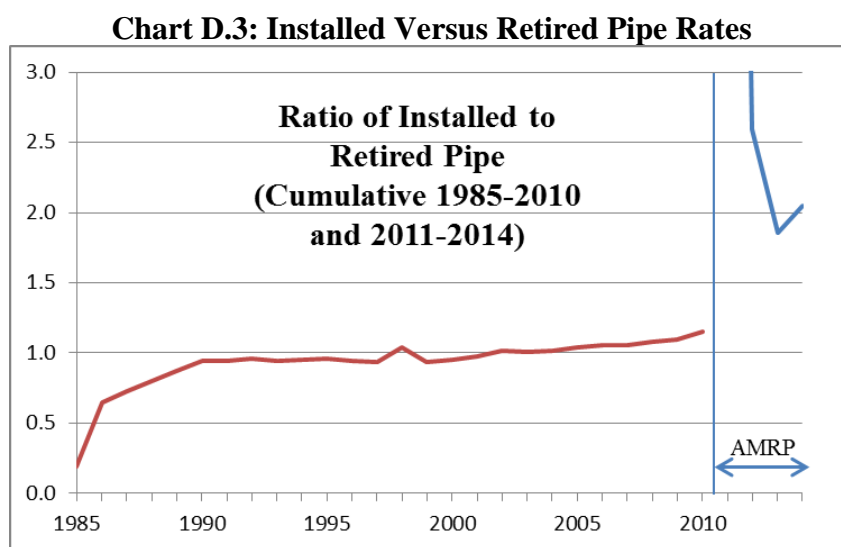
**Chart D.2: Cast and Ductile Iron Retirements History**



Liberty's particular focus lies on the period from the 2011 AMRP production start through the end of 2014. The pattern before this period provides useful background nevertheless. The historic pattern reveals that retirements in the most recent pre-AMRP years averaged less than 40 miles per year. A fairly consistent level of twice that amount applied in the late 1980s. Given the increasing national concern over leak-prone pipe, Liberty was surprised to see retirements at

Peoples Gas declining in the years leading up to the AMRP. Nevertheless, the historical data show that the current annual AMRP production targets do not appear remarkable in light of rates achieved in the late 1980s. The goal of 100 miles per year does not appear to require too great a stretch from rates attained in the past, although replacement today poses different challenges.

Interpreting the data requires recognition of the difference between new installed pipe and pipe retired. New installations generally exceed retirements. This difference is more pronounced under the AMRP, primarily due to the practice of double decking. The use of double decking as a construction approach results in the installation of two mains on a street, with each main feeding one side of the street. In addition, Peoples Gas experienced significant time lags between the time when some pipe is reported as installed and the corresponding retirement of the replaced pipe. The following chart illustrates the historical difference between installed and retired pipe on a cumulative basis.



The pre-AMRP ratio has run slightly above 1.0. That result is not unusual, because Peoples Gas did not use double decking at that time. Without special circumstances, such as double decking, one would assume that removed pipe would generally be replaced on a one-for-one basis. The ratio has become substantially greater than 1.0 in the AMRP years, again, reflecting double decking and the time lag. The latter factor has become particularly pronounced. The Company has not expressed a targeted installed/replaced ratio befitting its particular circumstances. The pre-AMRP ratio would clearly be too low. It would appear that the to-date AMRP ratio is clearly too high to be sustained. For the longer term, the definition and use of a sound ratio target has significant value to effective analysis and management. Such a target and the underlying data do not, however, appear in Peoples Gas' plans.

In order to derive a means for looking at the relationship between installations and retirements (given the lack of a Peoples Gas metric) Liberty examined the 2014 planned quantities. Examining data from progress reports yields a ratio of 1.28 for installed to retired miles of main. Liberty could not find any recent longer-term data that would confirm or suggest revisions to this 1.28 ratio calculation based on planned 2014 work. However, a review of the program cost estimate, as

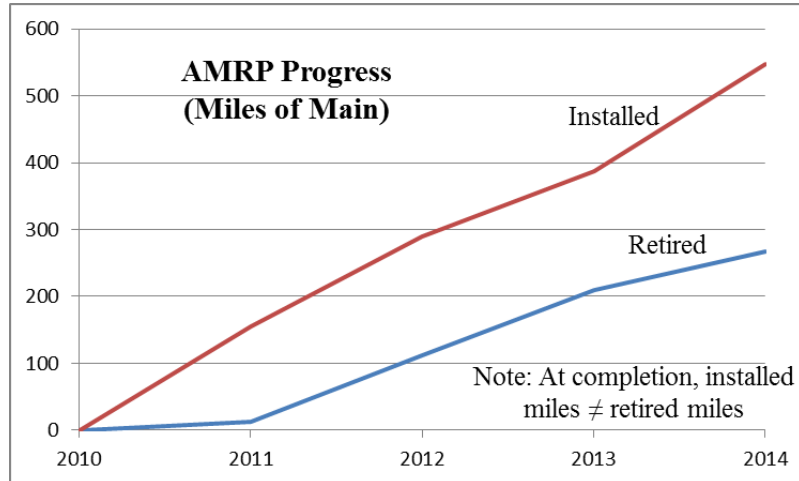
updated in 2012, shows a ratio of 1.54. Clearly, strong confidence in using such calculations is not possible. Peoples Gas must address the lack of a target and of reporting against such a target.

## f. AMRP Production

### i. Mains

The next chart depicts miles of main installed and replaced since AMRP inception.

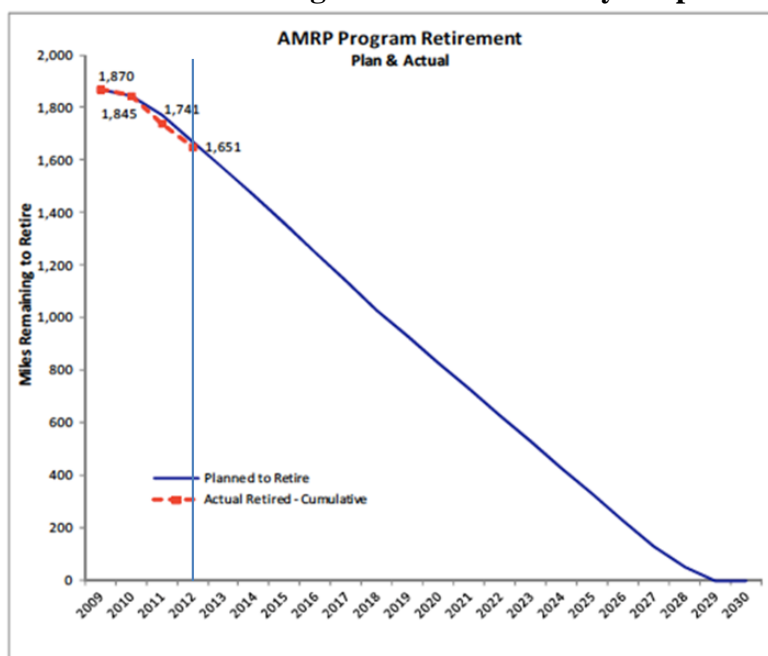
**Chart D.4: AMRP Main Installation and Retirement Miles**



Analyzing production to date requires clarification of the key parameters used. The AMRP targets elimination of leak-prone pipe. This goal makes “retirements” the most directly relevant measure of progress. However, retirements cannot take place until completion of replacements for the pipe to be retired. Replacements therefore become an important measure. Moreover, analyzing costs also brings attention to installation quantities. These quantities drive costs far more than do retirements. Thus, while the correct measure of bottom line schedule achievement remains “retirements,” sound management also required monitoring and managing installation effectiveness, efficiency, and schedule. The lack of a clear plan defining installation quantities and the absence of a metric employing the ratio of installed to retired miles make such monitoring difficult.

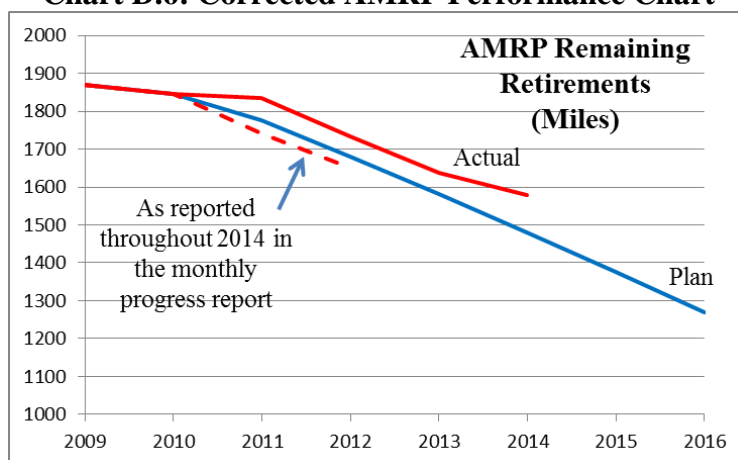
Peoples Gas has measured AMRP progress using the next chart.

**Chart D.5: AMRP Progress Measurement by Peoples Gas**



The Company has updated this chart only through the end of 2012. Moreover, it contains incorrect data. The December 2014 progress report, coming two years later, still shows this chart in its incorrect state. Most significantly, management cited this same chart as evidence that the project is on track, and in fact somewhat ahead of schedule. Peoples Gas' reliance on this chart (with its incorrect data points) as an indicator of program performance in 2014 provides a clear example of the need for significant change and improvement in AMRP monitoring and oversight. The next chart blows up and corrects the one that the Company has offered as an AMRP performance measurement basis. The dotted line shows data from 2014 monthly progress reports. The remaining data comes from the preceding chart.

**Chart D.6: Corrected AMRP Performance Chart**



The corrected information places AMRP progress actually behind, not ahead of, plan in 2012. It remained so in 2013, and fell further behind in 2014. The deviation at the end of 2014 amounts to

about 100 miles, which equates roughly to one year of planned production. The production trend after four full production years deviates from the plan, with the deviation growing in 2014. The next table summarizes main quantities installed and retired on annual and cumulative bases.

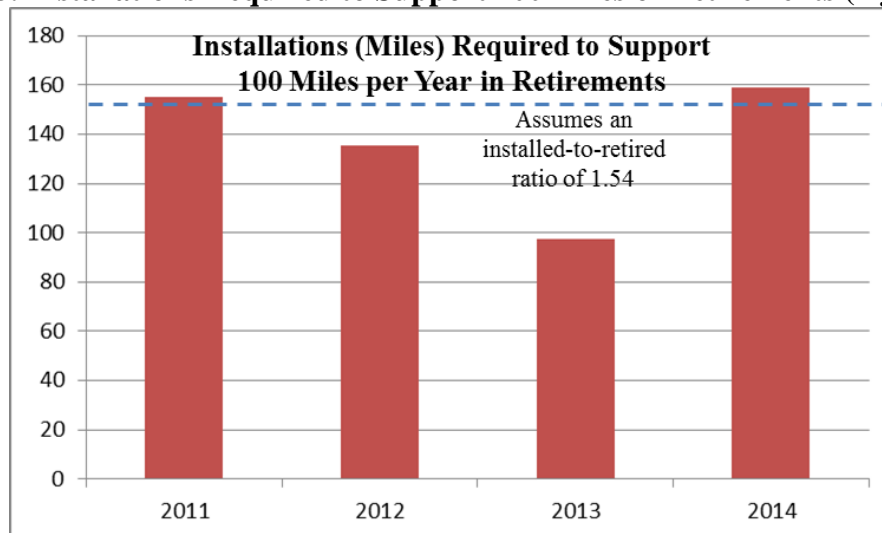
**Table D.7: AMRP Production Levels**

	AMRP Production (Miles)			
	Main Installed		Main Retired	
	Annual	Cumulative	Annual	Cumulative
<b>2011</b>	155.3	155.3	12.2	12.2
<b>2012</b>	135.2	290.5	100.3	112.5
<b>2013</b>	97.6	388.1	97.1	209.6
<b>2014</b>	159.1	547.2	58.4	268.0

Relatively high installed quantities may indicate good progress. One, however, cannot place confidence in that result absent a sound targeted installed-to-retired ratio. That ratio comprises a critical parameter in understanding performance but Liberty has seen no specification by Peoples Gas of the required level. The importance of such a ratio flows from the fact that it sets the value for how much new pipe must be installed. The 2012 estimate assumed 1.54 miles of new pipe for each mile of pipe retired. If this requirement is correct, one could equate the installed pipe so far (547.2 miles) to a corresponding amount of retirements presumably pending. The calculation simply would divide the amount of installed pipe by the ratio. That calculation would produce 355 miles. One would therefore conclude that the high amount of installations, regardless of how it compares to annual plans, nevertheless remains insufficient to support a 100 mile per year retirement effort.

Using another method, one could plot the installation quantities required to support a 100 mile per year retirement schedule. This approach (see the following chart) would require 154 miles of installations, assuming use of the 1.54 ratio from the 2012 estimate. This method would indicate that only the 2011 and 2014 installation rates supported a 100 mile per year retirement effort.

**Chart D.8: Installations Required to Support 100 Miles of Retirements (Hypothetical)**





Projecting an AMRP completion date needs to consider the installment/retirement ratio. Extrapolating retirement data to date suggests that a significant delay past 2030 completion looms. Liberty describes below its basis for concluding that the program has already fallen a year or more behind schedule. If in fact it has, extrapolating that delay across the long remaining AMRP life produces a completion date far behind the one addressed in the 2009 rate case. The need for corrective measures thus becomes clear. However, such an extrapolation is simplistic. It may prove incorrect based on actual physical installation progress so far. On the whole, Liberty considers pessimism to reflect the better judgment. This report addresses the many areas where program management and control warrant material improvement. It also addresses problems with progress information completeness and accuracy and the lack of analysis of data that does exist.

Absent top quality management and control, and lacking comprehensive and accurate performance data and reporting, it becomes difficult to maintain the optimism required to anticipate strong schedule performance. Super-projects (like the AMRP) invariably prove very difficult to manage, even under the best circumstances. Current circumstances and the current AMRP management mode make it proper to consider the Company's ability to sustain required production levels needed to support 2030 completion at high risk. Actual retirement progress also supports such an assessment, although the treatment of the installed-to-retired ratio might mitigate that conclusion.

*ii. Services and Meters*

AMRP management generates even less data on service and meter installations than is the case for pipe quantities. The next two tables summarize the limited data available. Liberty was able to use multiple information sources to generate a simplistic depiction of production in these areas, but not much more. Of particular note, data that shows planned versus actual installations is only available for 2013-2014. The first of the two following tables shows this comparison.

**Table D.9: Planned and Actual Service and Meter Installations**

	Services		Meters	
	Plan	Actual	Plan	Actual
<b>2013</b>	10,071	8,510		
<b>2014</b>	15,236	14,392	29,783	22,387

**Table D.10: Annual Service and Meter Installations**

	Annual Production	
	Services	Meters
<b>2011</b>	10,382	0
<b>2012</b>	12,712	16,050
<b>2013</b>	8,510	25,012
<b>2014</b>	12,828	22,387
<b>Total</b>	44,432	63,449

The second of the two preceding tables shows recorded service and meter installations for the AMRP. Substantial meter installations occurred in 2011 and 2012, but AMRP management did not track them until after early 2012. Liberty expected, but could not find, a target or plan/budget

assumption that would allow comparison of these volumes to some clear standard. The lack of a comprehensive 20-year plan setting forth such a standard precludes an effective answer from the perspective of AMRP management. The data available to measure against plan suggests that production lags behind intended levels. The absence of a long-term plan with quantified expectations, however, prevents putting these measurements into perspective for effective use by AMRP management, or for outside analysis by Liberty or others.

In order to provide some perspective, Liberty used the planned ratios for 2014. For this year all planned data proved available. The ratios for 2014 are 106 services and 207 meters per mile of installed pipe. Using such ratios is hypothetical (in terms of suggesting a long-term metric). They do, however, provide at least one recent source for approximating the production necessary to maintain progress and measure status. Using an annual main replacement target of 100 miles per year of pipe, the 2014 ratios produce the service and meter replacement requirements (and resulting deviations) through 2014 that the next table summarizes.

**Table D.11: Implied Service and Meter Installation Requirements (Scenario 1)**

			Deviation (Months of Production) <sup>1</sup>
	Required	Actual	
<b>Installed (miles)</b>	513	547	<b>3 months ahead</b>
<b>Retired (miles)</b>	400	267	<b>14 months behind</b>
<b>Services (each)</b>	54,366	44,432	<b>8 months behind</b>
<b>Meters (each)</b>	106,273	63,449	<b>17 months behind</b>

<sup>1</sup> Based on 2014 planned production rates

Later chapters of this report make clear that work at the front (main installation) end of the process better supports AMRP progress. Contractors perform this role. Rather, difficulties have been much more apparent in the back end of the process. Back end activities include service and meter work, which Peoples Gas internal resources perform. This differential performance has occurred despite the fact that the greater physical challenges of AMRP lie in the installation phase. Back-end problems would appear to be easier to correct. If so, then our first scenario may overstate the schedule situation. Liberty constructed a second scenario. It used ratios derived from the quantities from the 2012 (updated) cost estimate. That information indicates the following data points for relating key installation components: a ratio of 1.54 for installed/retired mains, 95 for services, and 134 for meters per mile of installed pipe. The next table shows the results produced by this scenario. On balance, both sets of ratios would conclude that retirements and meters lie considerably behind schedule, perhaps in the range of one year.

**Table D.12: Implied Service and Meter Installation Requirements (Scenario 2)**

			Deviation (Months of Production) <sup>1</sup>
	Required	Actual	
<b>Installed (miles)</b>	615	547	<b>5 months behind</b>
<b>Retired (miles)</b>	400	267	<b>16 months behind</b>
<b>Services (each)</b>	38,011	44,432	<b>5 months ahead</b>
<b>Meters (each)</b>	80,262	63,449	<b>10 months behind</b>

<sup>1</sup> Based on 2012 program estimate - DR 82, Attachment 1

### g. Cost and Productivity Performance

The next table summarizes AMRP spending through 2014. The table shows a planned, significant ramp-up in 2014. An increase in the rate of spending did occur, but to a level significantly less than planned. Spending in every major category ran below 2014 budget. At first glance, the levels of production described earlier in this chapter would thus seem high, given the level of underspending. If those spending levels reflect the application of insufficient resources relative to plan, then high levels of production would not be anticipated, absent particularly high productivity.

**Table D.13: AMRP Spending Summary**

AMRP Spending (millions of \$)		
	Budget	Actual
2011	108.6	90.7
2012	220.0	228.5
2013	220.8	192.1
2014	320.0	262.6
Total	869.4	773.9

AMRP data makes reported quantities uncertain. The inability to gather this data on a consistent basis substantially restricts the ability to conduct productivity analysis. Peoples Gas provided labor hours for some internal work, but not for contractor work. Contractors perform the bulk of AMRP work. Liberty observed a lack of reported contractor hours in other cases. However common the practice may be in the industry, Liberty finds it inconsistent with best practice, and particularly so on a program of the scope, magnitude, and duration of the AMRP.

Meter installations comprise the only AMRP area where productivity analysis can use hours required to produce units of work output. The next table summarizes meter productivity data that can be generated. Even for meters, however, no AMRP standard, assumption, or metric exists against which to compare installation productivity. The existence of a baseline for measuring productivity and the use of that baseline for continuous measurement and analysis is fundamental to effective management of even projects and programs much smaller than the AMRP. For example, the data in the next table shows a 10 percent drop in production from 2013 to 2014, even though hours spent did not change substantially. Finding out why such developments occur requires the use of standards and targets, the collection of actual performance information, and ongoing analysis of deviations, which Liberty did not find to be a focus of AMRP management.

**Table D.14: Meter Installation Productivity**

PGL Meter Productivity			
	Meters	Hours	Hrs/Mtr
2011	Not available		
2012	16,050	104,325	6.5
2013	25,012	163,268	6.5
2014	22,387	160,976	7.2
Average			6.8

Hours spent comprises the most direct means of analyzing productivity. The lack of AMRP labor hour data in other areas, however, restricts productivity analysis to the use of dollars. Good project and cost management requires a complete understanding of all labor hours. Chapter L: Cost Management addresses the need to develop such an understanding, especially for contractors. The data for mains installed has, as the next table shows, demonstrated improvement. Dollars spent per mile installed have declined. Data for services allows no meaningful observations. The trend for meters, as productivity measured in hours showed, is problematic.

**Table D.15: Dollar-Measured AMRP Productivity**

	S Per Unit Installed		
	Mains	Services	Meters
2011	389,569	1,763	
2012	1,230,030	3,170	411
2013	903,689	7,109	636
2014	894,406	3,539	880
Average	835,709	3,702	665

Peoples Gas stated that it has committed to making substantial improvements in its capabilities for analyzing costs and productivity. The limits on current capabilities mean that program management has much to do in terms of gathering consistent data and applying sound analysis to that data.

From a total cost point of view, management of the AMRP still uses the original, 2009 estimate, updated in 2012. Liberty believes that the resulting cost of \$4.451 billion will prove too low. Moreover, this estimate used 2012 dollars; *i.e.*, it provides for no escalation of costs due to inflation. In addition, the estimate provides for no contingencies which, for a twenty-year program, generally prove substantial.

#### **h. The Plan and List of Projects**

Part Two of this report discusses AMRP planning. For purposes of this chapter, which summarizes AMRP definition and status, the existing program plan lacks a number of important features. It lacks an identification of key parameters. It does not address quantities, resources, installation rates, unit costs, and key assumptions sufficiently. Generally, Peoples Gas has equated a plan with a list of work. In that regard, a plan does exist. The AMRP does have a full list of the projects to be completed over the 20-year timespan. The appendix to this chapter sets forth that list.

### **i. Company Analyses and Corrective Actions**

The AMRP monthly report comprises the program's primary source of reporting. This lengthy document contains a great deal of data, most of which has no substantial usefulness for management or for executives charged with project oversight. The most notable gaps lie in the lack of analysis of performance and of direct and measurable recommendations for corrective actions. The report also provides no work force data. This absence restricts the ability to measure and verify adjustments to resources needed to accelerate schedule or mitigate delays.

### **j. Comparisons with Similarly-Situated Companies**

Major main replacement work has become more common in the industry. It is useful to examine the performance of others, in order to provide a benchmark for gauging one's own approaches, methods, practices, and results. Liberty's inquiries uncovered no organized or documented approach to meeting this need at Peoples Gas. Instead, Integrys senior managers cite the experience of Jacobs Engineering, which leads and for the most part staffs the Project Management Office. Integrys management considers the experience of its contractor sufficient to provide insight into other companies' efforts, making other efforts to compare approaches and performance with other utilities unnecessary. Management also cites conversations by the Executive Vice President – Natural Gas Segment. We have found no organized follow-up to those conversations.

## **3. Conclusions**

### **D.1 Current AMRP plans do not provide for sufficient program definition and the program has not been supported with sufficient assembly and analysis of performance information. (Recommendations D.1 through D.6)**

The AMRP should operate under a comprehensive and credible long-term plan that addresses all major components in a complete and consistent fashion. Liberty found that the AMRP does not have an integrated, up-to-date, sufficiently comprehensive program plan. Such a plan should clearly state critical assumptions. Liberty found critical planning assumptions neither well defined nor well documented. The kind of plan that the AMRP requires includes the provision of suitable contingencies for growth and other uncertainties. Liberty found no provision for contingencies or allowances to address the change and growth that are all but inevitable for a program of the AMRP's scope, complexity, and duration. Program management does not address these matters on a long-term basis, but confines contingency use to annual planning, and even in that case, largely limited to contractor work.

The program management organization does not have detailed information about progress to date. Performance data is not consistent, fully reliable, or well-suited to the analysis that a program such as the AMRP requires. Past performance does not undergo rigorous and continual analysis to ensure optimization. Liberty has not found detailed, meaningful analysis of performance for the purpose of identifying improvement opportunities. Neither did Liberty's field work disclose substantial documentation of corrective actions taken to address performance issues. Scope change typically has a significant impact on programs like the AMRP. There should exist clear documentation of the degree to which scope evolution has affected the program. Scope growth, particularly in terms of expanding project requirements has had an impact on the AMRP. That impact is not well-documented or quantified. The absence of data produces an inability of program

management and senior leadership to isolate AMRP activities and costs from those of other work commonly managed with AMRP projects.

The following conclusions provide more detail regarding these general conclusions, and other areas material to the definition and status of the AMRP.

## **D.2 Peoples Gas has not sufficiently defined AMRP scope. (*Recommendation D.1*)**

The AMRP represents a massive commitment by the Company. Its reporting, both internally and externally, must be crystal clear. At the present time, the nature of this commitment does not appear to be universally understood internally. Moreover, scope is often reported as mixed with other (e.g., QIP, but non-AMRP) projects. Senior Integrys executive management expressed to Liberty the intent to establish a “world class” approach to AMRP management. Liberty considers that commitment as appropriate, if the Company is to optimize program performance. It certainly makes sense to apply such an approach to capital projects other than AMRP as well. Nevertheless, AMRP reporting cannot be confused with other projects. The commitments are substantial, and must be reported separately and clearly.

## **D.3 The collection, maintenance, and presentation of AMRP performance data falls well below standard. (*Recommendation D.2*)**

The quality of the data, after more than four years, does not serve a program of any substantial size, let alone a multi-billion dollar super-project like the AMRP. Basic data remains fragmented, inconsistent, dated, and in some cases in error. Assembly of data sets often requires more than one source, with the result that anyone trying to analyze performance, whether internal or external to Peoples Gas, cannot be sure of the validity of the data.

Costs are not presented in a manner that facilitates analysis. Planned quantities, except in a few instances, are not presented nor compared to actuals. Labor data, perhaps the most important management parameter, is lacking. That lack substantially constrains management’s ability to gauge the potential impact of added resources. Productivity in most areas cannot be determined in helpful ways. Moreover, some critical data, including the retirement data cited by management as the most important measure, is in error, and has not undergone updating for two years.

## **D.4 The goal to retire 100 miles of leak-prone main per year is reasonably achievable, assuming effective program management.**

In the seven years between 1985 and 1991, Peoples Gas retired an average of more than 79 miles of leak-prone pipe per year. The Company’s history includes more than 100 miles retired in 1991. The 1991 production of 101 miles remains the peak performance level, even after four AMRP production years. History suggests that the AMRP target of 100 miles is reasonably achievable, especially considering the massive commitment of money and resources.

However, the requirements associated with replacing a mile of pipe in 1991 have not remained static in the years that have transpired. The number of supporting installed miles now (given double decking) is much higher. Public expectations and government requirements are much greater as well. Nevertheless, the scaling factor (comparing to the late 1980s) in raw terms is only 25 percent,



but in real terms is likely more than 100. That factor appears manageable in the escalated framework of an AMRP.

**D.5 Production levels to date are not commensurate with program requirements or commitments although the most labor-intensive parameter, main installations, is somewhat encouraging.**

Using retirements as an AMRP “bottom line” suggests that the 268 miles retired after four years lags well behind the required 100 mile annual pace. Similarly, service installations have lagged somewhat, and meter installations more so. It is encouraging that the installations comprising the front end of the construction process (and the most labor-intensive part) have been proceeding at a faster pace. Whether that pace is sufficient to maintain schedule, however, cannot be gauged from the AMRP information that management can produce at this time.

**D.6 After four years, the project is not “on target” as suggested by Integrys management, but lags schedule and the trend is toward further schedule loss. (*Recommendation D.3*)**

AMRP performance data certainly should, but does not support a reasonably precise estimate of schedule performance versus 20-year requirements. Liberty took various approaches to hypothesizing estimates in substitution for data that does not exist. These estimates led Liberty to conclude that the schedule is at least six months and perhaps a year or more behind schedule. This lag is disconcerting, given the short amount of time it has taken to lose so much ground. Liberty acknowledges that our assessment uses limited and questionable data, but available information does not permit a better assessment.

**D.7 Peoples Gas has not mustered sufficient resources to support the AMRP in the last two years, as evidenced by significant under-spending versus the annual budget. (*Recommendation D.4*)**

The AMRP lacks the resource plan it needs for planning and performance assessment purposes. Absent the type of assessments such a plan would support, Liberty concluded that recurring under-spending against annual estimates and performance at the back-end of the process (*e.g.*, meters and retirements) provide primary indicators that Peoples Gas has not applied sufficient resources to sustain progress at targeted levels.

At the present time, the only visible resource reporting comes in the form of a homogenized chart of all resources presented under the title of “jobs created” in the monthly progress report. We have never seen project resources described or presented in such a manner. Such reporting may serve other purposes, but it serves no evident program management purpose, particularly given its status as the only resource metric provided. Further, the AMRP has no plan against which one can compare actual staffing. Absent such comparisons, management cannot effectively determine whether the data presented is bad or good in terms of optimizing program performance.

**D.8 The very limited productivity analysis possible at this time suggests comparatively stronger performance in main installations (performed by contractors) and a negative trend in meter installations (performed by Peoples Gas internal resources). (Recommendation D.5)**

The unit cost of mains installed has been decreasing slightly year-over-year. Even small decreases can be viewed as positive considering rising program demands and escalation in the unit costs of resources from year to year. The Peoples Gas-managed elements, however, (notably meters), are trending in the other direction, and require analysis and action, as appropriate.

**D.9 Peoples Gas' current project cost estimate significantly understates likely costs over the full AMRP duration. (Recommendation D.6)**

The most recent estimate is now nearly three years old and Peoples Gas has acknowledged that it is no longer useful. **A comprehensive, well-founded update is required as a matter of first priority.** The 2012 estimate does not consider escalation, and does not include any allowances for future growth or uncertainty. Accordingly, one should expect that a new, comprehensive, long-term estimate (prepared in accordance with good estimating practices) will evidence a substantial increase over the 2012 forecast.

## **4. Recommendations**

**D.1 As part of the new planning effort now underway, Peoples Gas should provide a clear and unambiguous description of the AMRP, including quantities for all parameters important to management of the project. (Conclusions D.1 and D.2)**

Part Two of this report addresses the requirements of effective plans. Such parameters include, at a minimum, all production quantities, labor hours and costs corresponding to production quantities, definition of "AMRP projects," key milestones, details for support functions, and resource requirements and plans.

**D.2 Peoples Gas should accompany regularly reported performance data with insightful analysis in order to make the data immediately meaningful to management oversight and supportive of timely and responsive improvement and corrective initiatives and activities. (Conclusions D.1 and D.3)**

Chapter O: Reports and Analysis addresses reporting requirements. For the present, this chapter has cited a number of examples of reporting gaps or weaknesses. Program management and executive oversight depend on candid and insightful reporting of performance. Managers and executives cannot provide effective oversight and instigate efforts to improve performance when they receive inadequate information. Those charged with management and oversight have no material use for meaningless data or information and analysis upon which they cannot act. What has become a long-term set of performance reporting issues needs to be corrected with communication.

**D.3 Peoples Gas should provide a realistic schedule assessment based on an effective program plan. (Conclusions D.1 and D.6)**

Peoples Gas must correct promptly its inability to access short-term performance and, more importantly, the long-term schedule outlook. Peoples Gas needs performance targets based on



long-term program requirements immediately. Simply providing a plan to make up the current schedule deviation over the next 15 years is likely to be simplistic and of little value. A more in-depth analysis is required, together with a front-end-loaded corrective scheme.

**D.4 Peoples Gas should prepare a soundly derived, detailed resource plan and provide for full coordination between the annual budget and resulting resource requirements. (Conclusions D.1 and D.7)**

The lack of a resource plan precludes effective spending plans and subsequent analysis of program schedules and performance. The gap was evidenced in 2014 when management sought contractor action to mitigate schedule delays, but did not have a sound basis to judge original contractor staffing plans and subsequent contractor staffing increases. The same problem existed with Peoples Gas engineering and crafts.

**D.5 In light of apparent decreases in productivity, Peoples Gas should promptly complete an analysis of productivity associated with the installation of meters. (Conclusions D.1 and D.8)**

Compared to the first two years of production (2012-13), the third year of meter installations (2014) suffered a productivity decline of about 10 percent. Absent a proper baseline for comparison, Liberty notes that this observation does not mean productivity was good in 2012-13, but only that productivity in 2014 was worse.

**D.6 Peoples Gas should promptly complete a new program cost estimate consistent with good estimating practices. (Conclusions D.1 and D.9)**

Chapter K: Cost Estimating discusses estimating requirements. The new estimate should include sufficient consideration of escalation and allowances for uncertainty and growth.

## Chapter D Appendix: 20-Year Plan (Neighborhood Plan Range)

Shop	H.No	Neighborhood	Paints					Neighborhood		Target Replacement
			Weighing					Score	Rank	Un-Adjusted (05/2013)
			25%	15%	20%	25%	15%			
			MP Ductile Iron Main	GI Main Older than	Un-repaired Leak	3" or smaller GI Main	Inside Meters			
N	1	Albany Park	54	34	46	54	31	217.2	4	2014-2018
S	2	Altgeld Gardens	-	-	16	13	0	28.5	182	2029-2030
N	3	Andersonville	-	26	26	36	18	106.5	96	2024-2028
N	4	Arcadia Terrace	-	25	36	37	18	115.9	86	2024-2028
C	5	Archer Heights	53	21	29	42	27	171.1	33	2019-2023
C	6	Arkburn	37	-	26	52	31	146.4	60	2024-2028
S	7	Avalon Park	47	27	16	41	22	152.0	55	2024-2028
N	8	Avondale	43	28	32	34	23	160.3	47	2019-2023
S	9	Back of the Yards	46	27	32	37	23	165.1	38	2014-2018
N	10	Belmont Central	45	26	42	53	32	196.8	16	2014-2018
N	11	Belmont Gardens	-	18	26	23	12	80.2	137	2024-2028
N	12	Belmont Heights	-	-	16	52	29	97.2	113	2024-2028
N	13	Belmont Terrace	44	-	16	39	20	118.9	83	2024-2028
S	14	Beverly	52	31	42	56	33	213.2	7	2014-2018
C	15	Beverly View	-	-	-	21	13	33.4	180	2029-2030
S	16	Beverly Woods	-	-	26	21	8	55.2	157	2029-2030
N	17	Birch Oak	-	-	-	43	26	68.7	148	2029-2030
N	18	Baumanville	49	22	29	29	20	148.2	58	2019-2023
S	19	Brainerd	40	19	22	48	30	159.2	48	2019-2023
S	20	Bridgeway	48	31	43	35	24	181.1	28	2019-2023
C	21	Brighton Park	55	30	41	46	29	200.7	13	2014-2018
S	22	Bronzeville	40	32	32	33	25	162.0	44	2019-2023
N	23	Brynford Park	-	-	-	-	-	-	-	-
N	24	Bucktown	53	18	36	24	30	161.3	46	2019-2023
N	25	Budlong Woods	-	18	22	46	25	111.1	92	2024-2028
N	26	Buena Park	43	22	26	26	21	137.4	66	2019-2023
S	27	Burnside	-	26	32	32	25	115.2	88	2024-2028
C	28	Cabrini Green	-	15	-	15	10	40.1	174	2029-2030
S	29	Calumet Heights	-	26	40	51	32	148.4	57	2024-2028
S	30	Canaryville	-	-	-	-	-	-	-	-
S	31	Chatham	44	31	36	53	30	194.9	19	2019-2023
C	32	Chicago Lawn	-	24	16	32	10	82.9	132	2024-2028
S	33	Chinatown	-	20	-	18	16	53.6	159	2029-2030
C	34	Chrysler Village	-	-	-	-	-	-	-	-
C	35	Clearing (E)	-	-	-	-	-	-	-	-
C	36	Clearing (W)	-	-	-	-	-	-	-	-
S	37	Cottage Grove Heights	-	12	16	40	12	80.3	136	2024-2028
N	38	Cragin	-	31	44	54	32	161.7	45	2019-2023
S	39	Dearborn Manor	-	17	22	12	0	50.6	160	2029-2030
C	40	Dearborn Park	-	12	-	12	16	40.5	172	2029-2030
C	41	Douglas Park	-	20	-	24	14	57.6	155	2029-2030
N	42	Dunning	52	-	22	21	12	106.3	97	2024-2028
S	43	East Beverly	-	24	16	40	19	97.6	112	2024-2028
S	44	East Chatham	-	22	26	39	18	105.1	101	2024-2028
C	45	East Garfield Park	39	30	40	42	32	182.6	26	2019-2023
S	46	East Hyde Park	-	-	-	-	-	-	-	-
C	47	East Pilsen	38	19	-	19	9	85.6	131	2024-2028
S	48	East Side	-	-	-	0	8	8.1	194	2029-2030
N	49	East Ukrainian Village	-	20	32	23	22	96.3	114	2024-2028
S	50	Eden Green	-	-	16	0	6	22.5	184	2029-2030
N	51	Edgewater	-	-	-	36	14	49.8	161	2029-2030
N	52	Edgewater	-	29	40	40	20	129.0	75	2024-2028
N	53	Edgewater Beach	-	19	22	25	22	87.5	129	2024-2028
N	54	Edgewater Glen	-	17	35	20	7	79.6	141	2029-2030
N	55	Edwan Park	52	12	32	22	15	133.0	70	2024-2028
S	56	Englewood	40	33	44	53	34	204.2	11	2014-2018
S	57	Fernwood	-	27	29	47	26	128.9	76	2024-2028

Shop	H.Nu	Neighborhood	MP Ductile Iron Main	CI Main Older than	Un- repaired and Leaking	8" or smaller CI Main	Inside Meters	Score	Rank	Un- Adjusted (05/20/13 )
C	58	Fifth City	-	17	-	23	20	59.0	154	2029-2030
C	59	Ford City	45	-	-	0	0	44.9	163	2029-2030
N	60	Forest Glen	-	20	-	33	14	67.6	150	2029-2030
S	61	Fuller Park	-	-	-	-	-	-	-	-
C	62	Fulton River District	-	12	-	13	0	25.3	183	2029-2030
C	63	Gage Park	45	32	43	50	27	195.6	18	2014-2018
N	64	Galewood	50	-	42	48	27	166.9	36	2019-2023
C	65	Garfield Ridge	48	-	32	56	33	169.5	35	2019-2023
N	66	Gladstone Park	-	16	16	28	16	75.1	144	2029-2030
C	67	Gold Coast	-	23	32	33	26	113.9	90	2024-2028
S	68	Golden Gate	-	-	-	-	-	-	-	-
C	69	Guare Island	51	18	22	19	14	122.0	81	2024-2028
N	70	Graceland West	-	23	26	26	13	88.3	127	2024-2028
S	71	Grand Crossing	43	32	39	51	29	194.9	19	2019-2023
C	72	Greektown	-	13	-	14	12	39.1	176	2029-2030
S	73	Gresham	50	30	36	55	33	204.3	10	2019-2023
S	74	Graveland Park	-	-	-	-	-	-	-	-
N	75	Hanran Park	-	19	-	25	11	54.1	158	2029-2030
S	76	Harbour Point Estates	-	-	-	-	-	-	-	-
C	77	Heart of Chicago	-	21	41	30	24	115.9	87	2024-2028
C	78	Heart of Italy	-	13	-	0	0	13.0	191	2029-2030
S	79	Hequich	-	-	-	0	0	0.4	195	2029-2030
N	80	Hermosa	-	26	39	29	12	105.7	99	2024-2028
N	81	Hollywood Park	-	19	29	31	18	96.0	115	2024-2028
C	82	Homan Square	-	-	-	0	8	8.4	193	2029-2030
N	83	Hornor Park	-	-	-	-	-	-	-	-
N	84	Humboldt Park	-	33	43	48	32	156.3	50	2019-2023
S	85	Hyde Park	56	-	16	14	9	94.3	120	2024-2028
S	86	Ickor Prairie Homes	-	16	-	12	13	40.6	171	2029-2030
S	87	Ida B. Wells / Dorrau Homes	-	-	-	-	-	-	-	-
C	88	Illinois Medical District	-	14	-	16	9	38.4	177	2029-2030
N	89	Irving Park	51	32	43	47	24	196.4	17	2019-2023
N	90	Irving Woods	53	-	16	45	25	138.1	65	2019-2023
S	91	Jackson Park Highlands	-	17	-	20	10	46.5	162	2029-2030
N	92	Jefferson Park	47	33	41	57	34	212.6	8	2014-2018
S	93	Jeffery Manor	-	-	22	48	21	90.4	124	2024-2028
N	94	Kelvin Park	-	17	22	26	11	75.6	143	2029-2030
S	95	Kennedy Park	-	-	-	-	-	-	-	-
S	96	Kenswood	41	27	22	36	19	144.5	61	2024-2028
N	97	Kilbourn Park	-	20	16	28	15	79.6	140	2029-2030
S	98	Lake Meadows	-	15	-	0	7	22.5	185	2029-2030
N	99	Lake View	42	34	45	55	33	208.9	9	2019-2023
N	100	Lake View East	-	24	29	31	21	104.9	102	2024-2028
N	101	Lakewood - Balmoral	-	18	29	22	13	82.5	133	2024-2028
N	102	Lathrop Homes	45	-	22	19	8	93.5	121	2024-2028
C	103	Laundale	38	30	43	37	26	173.1	31	2019-2023
C	104	LeClaire Courts	-	-	-	27	14	40.2	173	2029-2030
N	105	Lincoln Park	-	31	32	40	28	130.8	71	2024-2028
N	106	Lincoln Square	-	22	22	30	16	89.3	126	2024-2028
C	107	Lithuanian Plaza	-	13	-	17	7	36.3	179	2029-2030
C	108	Little Village	51	24	41	27	21	164.1	40	2019-2023
N	109	Logan Square	50	33	45	53	34	214.3	5	2014-2018
S	110	Landon Town	38	-	22	15	13	88.0	128	2024-2028
S	111	Langwood Manor	54	-	29	44	27	153.5	52	2019-2023
C	112	Magnificent Mile	-	13	-	16	12	41.3	168	2029-2030
N	113	Magnolia Glen	-	14	22	21	9	65.4	152	2029-2030
N	114	Marquette Park	-	21	-	24	11	56.4	156	2029-2030

Shop	H.Nu	Neighborhood	HP Ductile Iron Main	CI Main Older than	Un- repaired Leak	\$'s smaller CI Main	Inside Meters	Score	Rank	Un- Adjusted (05/20/13)
C	115	Marquette Park	39	28	32	50	28	176.6	29	2019-2023
C	116	Marycrest	-	-	-	-	-	-	-	-
S	117	Marynook	-	13	35	35	20	102.4	107	2024-2028
N	118	Mayfair	55	29	26	43	21	173.2	30	2019-2023
C	119	McKinley Park	44	25	-	34	24	126.8	79	2024-2028
N	120	Mantelore	-	-	35	41	29	104.5	103	2024-2028
S	121	Margan Park	57	12	45	54	31	197.8	15	2014-2018
S	122	Mount Greenwood	-	-	-	-	-	-	-	-
S	123	Mount Greenwood Heights	-	-	-	-	-	-	-	-
C	124	Near East Side	-	-	-	-	-	-	-	-
C	125	Near North	39	27	39	32	22	159.1	49	2019-2023
C	126	Near West Side	44	16	32	29	14	134.8	67	2024-2028
C	127	Noble Square	-	14	16	22	19	70.4	147	2029-2030
N	128	North Austin	42	25	40	38	28	172.6	32	2019-2023
N	129	North Center	-	23	29	33	17	101.4	108	2024-2028
S	130	North Kenwood	-	-	-	0	9	8.8	192	2029-2030
N	131	North Mayfair	-	27	16	44	25	112.1	91	2024-2028
N	132	North Park	-	24	29	38	24	114.5	89	2024-2028
N	133	Harwood Park East	-	23	-	50	30	102.9	106	2024-2028
N	134	Harwood Park West	51	15	-	49	28	142.9	62	2019-2023
S	135	Oakland	-	-	-	-	-	-	-	-
N	136	O'Hare	57	-	16	13	9	94.4	119	2024-2028
N	137	Old Edgebrook	-	-	-	-	-	-	-	-
N	138	Old Irving Park	54	31	32	45	27	188.5	21	2014-2018
N	139	Old Harwood Park	41	29	29	45	18	162.7	43	2019-2023
C	140	Old Town	-	20	36	25	23	103.4	105	2024-2028
N	141	Old Town Triangle	-	24	22	28	17	90.3	125	2024-2028
N	142	Oriole Park	56	-	-	47	26	129.2	74	2024-2028
N	143	Palmer Square	-	26	26	34	19	104.5	103	2024-2028
S	144	Park Manor	38	33	35	51	30	185.4	24	2019-2023
N	145	Park West	52	23	29	30	18	152.9	54	2019-2023
C	146	Parkview	-	-	22	31	15	67.1	151	2029-2030
S	147	Parkway Gardens	-	-	-	11	6	17.7	189	2029-2030
N	148	Peterzan Park	-	19	22	26	14	80.8	135	2024-2028
S	149	Pill Hill	-	18	16	28	17	78.2	142	2029-2030
C	150	Pilgron	-	23	32	24	29	107.7	95	2024-2028
N	151	Portage Park	56	33	44	56	33	221.0	1	2014-2018
C	152	Prairie District	-	14	16	15	0	44.8	164	2029-2030
S	153	Prairie Shores	-	-	-	-	-	-	-	-
S	154	Princeton Park	40	-	16	38	17	110.8	94	2024-2028
C	155	Printers Row	-	18	26	16	12	71.3	146	2029-2030
N	156	Pulaski Park	-	-	16	42	22	80.0	138	2024-2028
S	157	Pullman	-	-	-	-	-	-	-	-
N	158	Ranch Triangle	-	-	-	13	7	20.1	188	2029-2030
N	159	Ravenwood	-	32	44	49	31	156.3	50	2024-2028
N	160	Ravenwood Gardens	-	16	-	20	8	43.5	165	2029-2030
N	161	Ravenwood Manor	-	25	26	34	15	99.9	110	2024-2028
C	162	River North	46	20	35	17	16	134.1	68	2024-2028
C	163	River West	-	-	-	-	-	-	-	-
S	164	Riverdale	-	-	-	-	-	-	-	-
N	165	River's Edge	-	-	-	-	-	-	-	-
N	166	Rogers Park	-	-	-	-	-	-	-	-
N	167	Roseville	-	30	35	44	24	133.3	69	2024-2028
S	168	Roseland	47	32	41	52	31	202.6	12	2019-2023
S	169	Rosemont	47	26	26	46	26	170.4	34	2019-2023
N	170	Sauganah	-	-	16	49	30	94.5	118	2024-2028
N	171	Sauganah Woods	-	-	-	-	-	-	-	-

# Part Two: AMRP Planning

## *Chapter E Table of Contents*

Chapter E: The Plan for Management .....	E-1
1. Background .....	E-1
2. Findings.....	E-2
a. Organizational Assessment.....	E-2
b. Management Plan.....	E-3
c. Choosing an Effective Operating Model .....	E-5
d. Program Management.....	E-7
3. Conclusions.....	E-12
4. Recommendations.....	E-15

## Chapter E: The Plan for Management

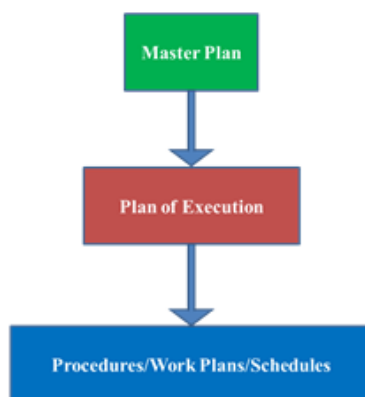
### 1. Background

This chapter:

- Discusses the overall or “master” plan for management of the AMRP, its relationship to lower levels of program and project management, and the procedures and process for effectively carrying out program and project management
- Describes the fit between the Integrys and Peoples Gas organization and resources and approaches to providing for AMRP management, oversight, and control
- Addresses the importance of selecting an effective model or approach to AMRP management, oversight, and control
- Assesses the management plan adopted for AMRP management, oversight, and control
- Discusses AMRP scope, plan, and execution structure
- Evaluates key overall elements of AMRP management at the program level.

The utility industry recognizes the need for an effective master plan for projects or programs of substantial size and duration. The need for an effective plan to *manage* such projects or programs has equal importance, but less universal recognition. The “plan for management,” or the “plan for execution,” lies below the project master plan in planning hierarchy, but makes an equally critical contribution to effective and efficient performance. The next illustration shows the planning hierarchy appropriate for a program like the AMRP.

**Illustration E.1: Plan Hierarchy**



The master plan describes overall program scope, cost, quantities, schedule, expectations, and resources. Effectively answering the question of “What is the AMRP?” should comprise its principal focus. The question of “How will we manage the AMRP?” should form the focus of the plan of execution. This second level plan should address the program management approach, the approach for managing the program’s specific projects, the organizations responsible, the cost and schedule systems that apply, the means for assuring quality, the forms that oversight will take, and the applicable controls. The final level of the hierarchy (procedures, work plans, schedules) describes the details that guide actions that the plan of execution contemplates.

Peoples Gas adopted at the outset of the AMRP a plan to which Liberty's report makes a number of references. The contents of this so-called Project Execution Plan make it largely a plan for execution. Its level of detail extends well beyond that contemplated by a master plan.

An effective master plan defines the scope and commitments of the program in terms of production requirements, cost, progress and performance goals, organizational approaches, skills and resource needs. This top level plan should provide a summary-level treatment of each element needed to communicate the nature of the program. It should provide a clear picture of management's commitments and expectations. The communication aspects of the master plan serve a critical role. For a program like the AMRP, the master plan must define what will be done. Its clarity and completeness in providing this definition serve a purpose outside AMRP management as well. It should be sufficient to allow regulators and stakeholders to form correct and sufficient expectations and understandings of management commitments.

The management plan, or the plan for execution, describes the management of the program. The approach to project management, roles and responsibilities of participating organizations, cost management approach, scheduling and schedule control, resource planning, quality management, procurement, management systems, oversight, and controls exemplify the elements required in a sound management plan.

Comprehensive detailed procedures, plans, schedules, and other implementing activities, systems, and tools must also exist. They promote effective and efficient execution of the management or execution plan. The remainder of this Part Two and the chapters of Part Three of this report address them. The top-level plan for management should not contain this extensive detail, given its overall role and purpose. The plan for management should lay a strong foundation for giving confidence to executive management and the board of directors that program management has created and operates under sound day-to-day direction. The management plan thus comprises a strong contributor to effective oversight and governance. Too much detail diminishes its effectiveness, as happened in the AMRP's early years. The management plan effectively operates as a contract among program management, executive management, and the board of directors. It should provide a clear and comprehensive baseline for defining and measuring the effectiveness of management's execution of the program.

A plan for management must reflect the specific attributes of the organization that will execute it. An organization may have weaknesses (or strengths) in certain attributes or cultural characteristics. The plan for management should recognize such attributes. It should adopt, for example, specific features to mitigate organizational weaknesses. Creating elaborate systems and tools does not promote effectiveness and efficiency where systemic or cultural constraints preclude their effective application. Such constraints can prove difficult to identify. Personnel inside an organization often have no awareness of them, or in some cases the willingness to disclose them.

## **2. Findings**

### **a. Organizational Assessment**

The plan for management must align with the attributes and attitudes of the organization. For example, inordinate priority for engineering perfection can make control of scope very



cumbersome. An objective self-assessment of the organization should take place before establishing a plan for the management of a program of the AMRP's size, complexity, and duration. The need for such an assessment often goes unrecognized. When it does, plans formed on the basis of assumptions that do not comport fully with program and organization needs often result.

That was the case with initial AMRP planning. A self-assessment at the outset of the AMRP planning would have identified circumstances like the following:

- The program's 20-year duration and multi-billion dollar costs make a "world class" management program and organization both appropriate and affordable.
- Peoples Gas/Integrys had insufficient in-house skills, management capabilities, and management systems to provide world-class management of the program. The management plan therefore needed to provide for the acquisition and development of needed skills, capabilities, and systems.
- Internal relationships between Peoples Gas and Integrys would not permit the fully cooperative effort required for a program of this magnitude. That relationship effectively ruled out a "weak" project manager approach. A matrix approach (in which the project manager has limited direct authority over the managers critical to program success) works well for many organizations and projects. Its effectiveness, however, depends on the particular circumstances at hand. At Peoples Gas, a "strong" management structure would best serve to nurture (or force) the requisite level of cooperation.

Liberty observed internal conflicts and cultural issues at Peoples Gas and Integrys. Such circumstances are not unusual in parent/subsidiary relationships, particularly following acquisitions. In the case of Peoples Gas, the conflicts and cultural issues concern apportionment of responsibility, specifically between program management (Integrys) and construction (Peoples Gas). Integrys management had limited ability to direct performance and to influence Peoples Gas construction responsibilities. As schedule performance in the Peoples Gas scope declined, program management personnel lacked the ability to bring about corrections directly.

Senior leadership at Integrys recognized this issue. Appointing an executive vice president with a broad enough job description and responsibilities to cover both organizations reflected an effort to manage conflicting approaches and priorities. However, that appointment did not resolve the issues.

Five years into the program, the need for response to these circumstances remains. Senior leadership, however, does appear committed to new initiatives to restructure the program in a manner designed to address them. However, a great deal of work lies ahead in turning those initiatives into meaningful and lasting change.

#### **b. Management Plan**

Best practice views the plan for management as separate and distinct from the plan of execution. Some organizations, however, merge some or all of the characteristics of the two into a single planning document. Early in the AMRP, Jacobs Engineering took the lead in drafting for Peoples Gas a Project Execution Plan ("PEP"). That extensive document incorporated many characteristics that define an appropriate plan of execution. It represented a sound first step in providing for strong

and effective management of the AMRP. The principal failings associated with its introduction lie in the lack of follow-up work to build upon that plan and its execution. Over the AMRP's early years, some of the Project Execution Plan's valuable ideas and concepts failed to mature sufficiently, or fell by the wayside. Thus, despite the thought and care that went into this plan, four years later, it has become difficult to see how the document serves the AMRP.

The Project Execution Plan may have proven premature, in the sense that the Project Management Office could not meet the standards it set. The plan's 113-page length may have contributed to its failure to become a central and ongoing part of program management as well. Its length is certainly daunting for use at executive and oversight levels. A simplified and more concise expression for those responsible for top-level oversight may have led to more effective use of the plan as a source for building a better program management, control, and oversight structure. Liberty found, however, that the AMRP has not developed (as discussed in other chapters of this report) an approach that makes sufficient demands on program management, in terms of ensuring scrutiny over and challenges of program management decisions and actions.

The original plan's authors also contemplated an annual update. Management has not followed through on that schedule. Liberty found no updates. Senior leadership has committed to a significant effort to revamp the document, which Liberty finds appropriate. The need to do so, however, illustrates its diminishing role as a source of definition and guidance across the AMRP's early years.

Liberty found the Project Execution Plan a quality product exhibiting knowledge about what to do. Some of the expectations it created in fact reached for an industry-leading position. The plan called, for example, for the *"transformation of PGL from a reactive system maintenance organization to a state-of-the-art modern, progressive and proactive gas utility."* AMRP management would find itself in a much better position today, had it provided the attention and support needed to approach the status contemplated by that plan.

Observing the lack of follow-through in pursuing the original Project Execution Plan has particular relevance today. New senior leadership at Peoples Gas has expressed a notable commitment to making improvements in the management and execution of the AMRP. That commitment includes a stated initiative to revise the plan and to make it a cornerstone of program management. The lesson that history at Peoples Gas teaches concerns the ability to sustain that commitment and to make the new plan more than a "shelf document" as the program progresses. It will take a level of persistence and dedication that did not occur before, and that must be considered at risk still. Liberty's began discussions with new management about improvement initiatives last September. Those discussions produced the observation that management recognizes the propriety of healthy skepticism about the ability to make real and lasting change. That skepticism places a heavy burden on management to present strong solutions and credible implementation plans, to provide for their full and prompt execution, and to ensure their continuation and further evolution across the AMRP's long remaining duration.

Summarizing some of the Project Execution Plan's important features, Liberty found that it contained a reasonable, although too detailed, scope. Given the current state of the AMRP and its

controls, Liberty considers it appropriate to place particular emphasis on several key control processes in the revised program plans, including:

- A cost estimating capability supported by processes that: (a) establish a valid cost monitoring base, and (b) forecast final program costs with an appropriate level of confidence and in the context of a comprehensive addressing of risk, or contingency
- A scheduling organization and processes that produce realistic schedules at all levels, containing the details required to support engineering, permitting, procurement, work planning, construction, and contractor activities
- Resource planning that employs staffing strategies, crew allocations, contractor management, training requirements, and productivity measurements
- A work management process that supports the facilitation of work activities that extend from design through construction to completion
- A cost management program that promotes a culture of program cost control, and supports it with organizational clout, experienced and professional resources, and an emphasis on enhancing effectiveness and efficiency
- Cost reporting designed to precipitate corrective and improvement actions
- Scope control that identifies potential scope growth, to minimize cost and schedule impacts
- Procurement strategies that take advantage of large purchases to obtain favorable pricing, timely deliveries that support the program, above average service, and other benefits derived from the leverage that the AMRP gives Peoples Gas in dealing with providers
- Contracting management that takes advantage of the magnitude and long-term nature of a mega-program to develop beneficial and creative relationships with contractors.

### **c. Choosing an Effective Operating Model**

The AMRP requires managing in a manner consistent with the requirements of a multi-billion dollar mega-program having a multi-decade duration. Doing so requires clear assignment of responsibilities under an organization structure that provides dedicated resources to all planning, permitting, design, procurement, construction, completion, and project management and control functions. Each of those functions must operate under a clear and comprehensive description of the activities required to support overall program success.

The organization must operate under active and dedicated owner leadership and management. A twenty-year program provides an opportunity Peoples Gas should take to develop a dedicated core of internal personnel in program management positions. Doing so will enhance program management and oversight and will provide a unique opportunity for leadership development generally.

The AMRP organization must provide strong resources (in numbers and talent) and high levels of system and process sophistication. Only experienced people operating in a sound structure and in sufficient numbers can make sound overall strategies and plans work effectively. A program such as the AMRP spans much of a career-long duration. It calls for significant investment in development and retention of field, supervisory, management, and executive employees.

A recent PwC review observed the absence of a formally defined operating model or project delivery strategy recognizing new regulatory cost treatment. PwC also observed gaps in associated

processes and controls. Peoples Gas reported during mid-summer 2014 Liberty field work that the AMRP leadership model remained an open issue. PwC also reported finding executive recognition of “the need to define and re-establish a formal project delivery strategy and operating model,” and that “the responsible executives are proceeding with these efforts.”

Liberty learned early in its work that the operating model question remained open primarily because of leadership issues at Peoples Gas and Integrys. Peoples Gas announced the retirement of its president in April of 2014, but did not name his successor until early September. In June 2014, Integrys also promoted the AMRP’s executive manager to the position of Executive Vice President of Integrys’ Gas Business Unit. This promotion made him responsible for management of Integrys gas utility operations beyond those of Peoples Gas. His replacement, or to whom the AMRP would report, had not yet been identified.

Nine days after the promotion of this Integrys senior executive, Wisconsin Energy announced that it would acquire Integrys. That announcement came with the statement that the proposed acquirer did not contemplate that the new executive vice president (or any other Integrys or Peoples Gas executive) would form part of the post-acquisition senior management team. Wisconsin Energy stated that:

*Upon completion of the transaction, [Wisconsin Energy’s current CEO] will become chairman and CEO of the combined company. [The current Integrys CEO] will remain in his current roles with Integrys until the closing of the transaction, when he will retire. The other senior leadership roles in the combined company will be filled by current senior officers of Wisconsin Energy.*

Liberty’s discussions about AMRP planning, organization, and structure thus came in the midst of large uncertainties caused by present and pending changes in senior leadership. Very senior Integrys management personnel stated to Liberty that some questions about program structure would be for post-acquisition management to address. Liberty was given to understand that major policy issues were “on hold” pending the leadership transitions at Peoples Gas and Integrys.

A special analysis team Integrys formed in January 2014 had responsibility for addressing issues about project delivery strategy. Its work appropriately took an end-to-end focus, seeking process improvements from long-term plan to project close-out. Liberty’s observations of this team, which worked with PwC, corroborated the need to address overall AMRP planning. Their concerns, as well as those of PwC, bear substantial similarity to a number of those developed by Liberty, including:

- Inconsistent perceptions about how AMRP management would operate in the future
- Definition of long-term plans and roles of the Project Management Office
- Facilitating and emphasizing “ownership” of key processes
- Assigning accountability for work tasks
- Providing for a full understanding of program and project roles.

As of September 2014, action on addressing team recommendations was reported as awaiting completion of a change in the top Peoples Gas executive position. That transition has now occurred. As discussed throughout this report, that transition has produced expressions of

commitment to a number of important initiatives. New leadership has shown attention to a broad series of changes. However, Liberty considers the future of current new management at Peoples Gas to be in doubt, given the pending acquisition.

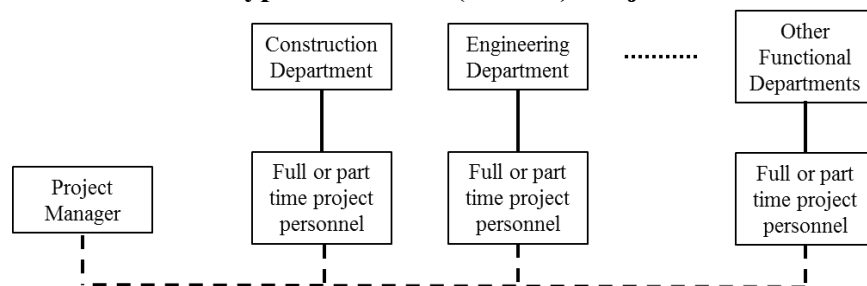
#### d. Program Management

##### i. Approach

The choice of how to structure and design a project organization has far-reaching implications. Two primary options have common industry application, with variations in between them.

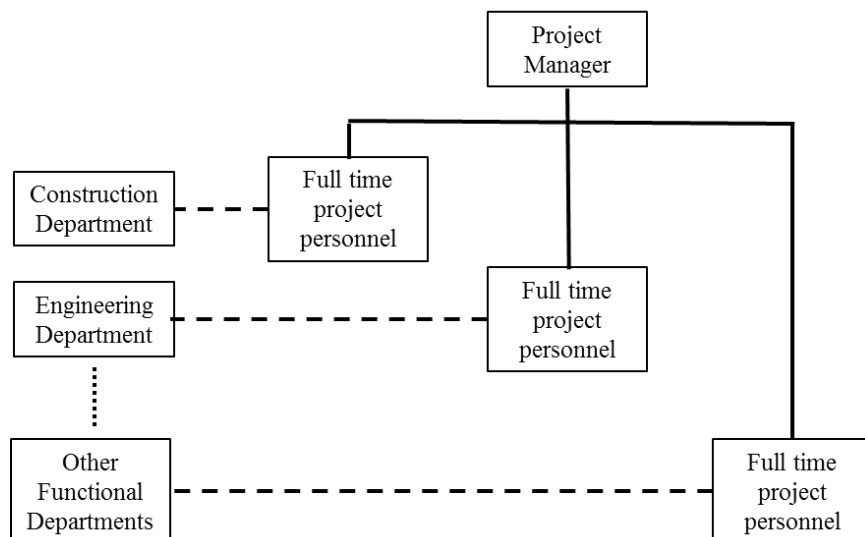
The first approach employs what the industry terms a “weak” project manager: While it may sound negative, a “weak” project structure often proves very effective. The next chart illustrates this approach. A weak approach uses a largely matrix-type organization. The functional groups (*e.g.*, engineering, construction, procurement, quality) take day-to-day technical direction from functional management and project direction from the project manager, usually via a dotted-line relationship. Decision-making occurs at the functional level and functional managers have limited accountability to the project manager.

**Chart E.2: Typical “Weak” (Matrix) Project Structure**



The second approach employs a so-called “strong” project manager. The term does not refer to the project manager’s capabilities or style. Rather, it denotes the use of a dedicated project organization that employs full-time (not matrixed) functional groups reporting to the project manager. These groups may also have a dotted-line relationship for technical support and direction back to a functional leader. The project manager has full authority.

**Chart E.3: Strong Project Manager Structure**



A broad spectrum of choices exists between the two approaches pictured above. Organization designers have many workable options. The following illustration shows the differences and the range of options.

**Figure E.4: Features Differentiating Project Approaches**



There is no universal, correct choice. The weak project management approach often serves as the optimum approach. It actually requires a strong manager; *i.e.*, one who gets things done by consensus building or “jawboning,” rather than by exercising direct authority. Approaches moving toward the “weak” end of the spectrum require increasing degrees of cooperation and teamwork.

The strong approach brings advantages in a number of circumstances. First, only the largest projects can afford large groups of dedicated resources. The smaller the project, the more likely the need for sharing resources. Second, technical expertise theoretically becomes weaker, because one no longer has call on the entire technical organization and leadership. Project success, under strong project management, becomes more dependent on the capabilities of dedicated resources.

Liberty does not consider the choice of a weak project management approach for the AMRP optimum. First, the relationship between Integrys and Peoples Gas did not commend an approach that relies more on cooperation among organizations with different priorities and approaches. Equally important, the size and duration of the AMRP make a dedicated organization with comparatively larger numbers of qualified people more affordable. Management can secure strong

contributors, assign them only to the AMRP, sustain a large and dedicated staff over the program's life, and offer career-length opportunities for many.

A program like the AMRP cannot function effectively as a “tack-on” to day-to-day responsibilities and activities of a company like Peoples Gas. Regular program functions, not to mention inevitable crises, require a dedicated structural approach to serve program needs fully, while allowing sufficient attention to other matters. The scope and importance of those matters will not generally diminish. Management of a mega-program will demand attention on a recurring, long-term, and sometimes unpredictable basis. Even the best organization simply cannot perform normal duties with an AMRP treated as an add-on. Problems that the AMRP experienced with respect to the back end AMRP work (meter installations, for example) performed by internal Peoples Gas resources exemplify this situation.

*ii. AMRP Program Management*

Successful performance of the AMRP depends on a strong emphasis on program management commitment and oversight. Early Liberty work raised concerns about that commitment, as evidenced by a number of indicators:

- The role of Peoples Gas or Integrys employees in the management of the program was limited and indirect
- The lack of a strong owner presence with a corresponding level of leadership weakened management, oversight, and control
- This approach to owner involvement resulted in a near total reliance on a contractor (Jacobs Engineering) for staffing program management functions
- The lack of a long-term plan and efforts to build internal skills and capabilities existed
- There was limited owner program management presence in Chicago
- That management did not bring sufficient coordination and control of engineering and construction resources in performing key AMRP work activities.

The Integrys Project Management Office had responsibility for managing the main and service installation portions of AMRP work. A senior Integrys person headed that organization, but operated from outside Chicago. Liberty learned that the plan had been to create a truly integrated contractor/employee Project Management Office. Early interviews indicated a plan to add Integrys personnel in leadership roles to the management organization largely staffed by an outside firm. Liberty observed, however, only limited numbers of Integrys personnel. Moreover, they filled roles more on the periphery of the organization than in leadership. The Project Management Office chart provided literally superimposed the few Integrys members on the organization chart populated by contractor personnel, placing internal employees along one of the chart's edges.

As a result, the AMRP's Project Management Office continues to rely on personnel from Jacobs Engineering to provide project management of the main and service installation portion of the AMRP. This is not to criticize the outside firm, but to observe insufficient owner management and direction.

There was thus no Chicago-based, dedicated, owner-centric management group responsible for main and service installations. Moreover, responsibility for critical, last-stage tie-in, meter setting,

and relighting work resided outside the Project Management Office. Each of the three, geographically-divided “Shops” of Peoples Gas performed such work using employee crews. Coordination of effort between the Integrys and Peoples Gas organizations was not strong. The lack of dedicated, common management of all AMRP activities contributed to the lack of coordination.

Liberty considers the following attributes, all of which were lacking in at least some form on the AMRP, to be those best suited to optimizing the performance of such a major program:

- High level, full time, on-site program management
- Long-term organizational vision for the life of the project
- Owner expertise to lead or guide, and at least actively participate in, all core functions
- Permanent, as opposed to transient, identity of an elite project team
- An integrated organization
- Clear executive commitment and support, actively and continually exercised and communicated
- Accountability for performance and the ability to enforce it at both the program manager and functional levels
- Sound philosophy on high level usage of contractors
- Strong technical and analytical skills in management controls in the Project Management Office
- Effective reports with strong analytical components that identify performance issues and their causes, together with potential corrective measures
- Ability to forecast on a real-time basis final program cost
- A comprehensive long-term resource planning processes for engineering and construction resources
- An up-to-date succession plan for key management and supervisory positions.

### *iii. Management of AMRP Projects*

How Peoples Gas has managed the overall AMRP comprises a principal focus of this study. The requisite project management skills address the planning, flow, execution, and management of more than a thousand people. Personnel with senior-level skills need to direct and coordinate many organizations, and many stakeholders, in order to keep the program moving with efficiency, effectiveness, and transparency.

However, project management skills need to exist at another level as well; *i.e.*, the individual projects that collectively comprise the AMRP. Individual projects within the AMRP involve many organizations, complex coordination challenges, many millions of dollars, and skill requirements. Government coordination, contract management, safety, quality, cost, schedule, and labor management provide some examples of these needed skills. The skills required have similarity to those that program management requires, but have application at a different level. The program management function executes through a wide array of managers, mostly at high levels. In contrast, individual project managers interact with people much closer to the work. Both levels require substantial experience and the ability to bring people together. They form prerequisites of an effective program and project management organization.



An option for addressing project level challenges would assign a project manager to every project or neighborhood to assure effective management and coordination of all work elements involved. The AMRP did not operate under this approach. The Company assigned project managers only to “high risk” projects. That included four projects: (1) Calumet Transmission, (2) High Pressure Interconnect, (3) Public Improvement Projects, and (4) the Loop Project. The Company has stated that it is in the process of staffing up to enable it to assign a manager to each AMRP project.

The key roles of project managers associated with the four high risk projects include:

- Complete all project planning activities, thoroughly and completely.
  - Develop all components of the project plan as specified in the project management methods
  - Ensure joint ownership of the project plans by including participation of team leads, subject matter experts, and key stakeholders in development of the plans
  - Work closely with the project sponsor to ensure that clear deliverables, project measures, and critical success factors are documented
  - Facilitate development of time, cost, functionality and safety parameters for the project
  - Work with the Project Leadership Team to ensure project funding and a project team appropriately resourced with skilled personnel
  - Recommend timing of formal milestone reviews and participate in getting the project approved
  - Ensure the plans are communicated, understood, approved by management and bought-into by project team
- Set up project team and structure and ensure understanding of project team roles and accountabilities.
  - Negotiate with business and technical resource managers to gain commitment of skilled resources to the project
  - Ensure identification of key internal stakeholders, solicit their input, keep them up-to-date in project communications, and use them as a proponent for changes in their functional areas
  - Recommend appropriate incentives, as necessary
  - Ensure project team roles and accountabilities are clear and understood
  - Assign project activities to team members based on skills, desires and growth opportunities (identified by the resource manager)
- Execute the project against plan to assure functionality within cost, time, and safety parameters.
  - Work closely with the project team and with leadership to assure project progress as planned, project cost control, and realization of project benefits
  - Actively engage project team members, ensuring they understand weekly expectations
  - Reinforce cross-functional team and business unit cooperation
  - Maintain up-to-date project plans and cash flow projections
  - Review (at least weekly) progress against the project plans (tasks, milestones, deliverables, costs, resources, schedule)
  - Track and resolve issues; elevate issues that cannot be resolved by the team to prevent impacts to the project schedule
  - Track and resolve changes, balancing the needs of stakeholders and impacts to functionality, deliverables, cost, and schedule

- Track project risks, implementing mitigation strategies
- Coordinate project with other related projects (deliverables, timing, overlapping resources)
- Ensure administrative task completion, including time recording and project documentation
- Acquire final project sign-offs and acceptance
- Ensure smooth implementation, focusing on communication and change management
- Conduct review of performance and lessons learned; publish post-project report
- Communicate key project information with project leadership team, project steering committee, and project team.
  - Ensure a common understanding of strategic, business, and project vision; share how each team member contributes to project success
  - Conduct regularly scheduled project team meetings (progress, issues, upcoming activities, expectations for the week, scope changes)
  - Conduct regularly scheduled project leadership meetings; participate in project steering committee meetings
  - Ask questions of team members to understand true project status
  - Publish complete and accurate status reports to team members, project leadership team, project steering committee, and project champion
  - Recommend to project leadership team timing and content of proactive project communications
  - Ensure active engagement of business unit leaders to assist with change management and implementation
- Effectively lead the project team through team development stages.
  - Advocate for the project and project team
  - Gain personal and team commitment to the project
  - Seek ways to recognize and reward project team members
  - Reinforce team collaboration
  - Resolve interpersonal conflict and team dynamics issues
  - Foster a solution-focused team attitude
  - Host the project celebration to recognize and reward project team.

The above description illustrates the demands that a weak project management imposes and the challenges of getting things done with limited authority.

### 3. Conclusions

#### **E.1. A strong first effort at instituting a plan for the management of the AMRP occurred in 2011, but fell into disuse after failing to gain traction. (*Recommendations E.1 and E.2*)**

A strong start in defining how to manage the AMRP came in 2011. Unfortunately, sound program ideas and some strong statements of objectives have not translated into a plan for management that effectively guides the AMRP today. Committing to such elements of the Project Execution Program's effectiveness and building upon the principles it established would have placed the program in a more desirable place than exists today. A number of possible inquiries may explain why the plan did not become a foundation element of AMRP management:

- Was the plan ahead of its time; *i.e.*, put in place before the organization had the skills and capability to implement it?
- Was it too detailed, too complex?
- Did it cover too much ground?
- Was its content suitable for day-to-day reference?
- Did management properly introduce it, set good expectations for its use, and communicate a commitment to following it to the organization?
- Did its external authorship (Jacobs Engineering) detract from internal acceptance?
- Were its details prepared too soon; *i.e.*, with insufficient time to build and develop the processes needed?
- Did management assign anyone the responsibility of maintaining and keeping it up to date?
- Did the commitments and instructions not fully align with management's intentions, thus potentially invalidating the plan? (*e.g.*, "Transformation of PGL from a reactive system maintenance organization to a state-of-the-art modern, progressive and proactive gas utility" does not appear to be a concept with which management agreed).

Answers to these questions would be speculative, but Liberty did find sufficient reason to conclude that a lack of management backing has played a major role. Words on paper alone do not produce results. A strong management commitment, regularly reinforced, must accompany them.

**E.2 The early years of developing the AMRP management organization have not brought sufficient skills, capabilities, and systems to provide the world-class management that the AMRP warrants. (*Recommendation E.3*)**

A program of the magnitude and duration of the AMRP deserves, and can afford, a sophisticated organization. It should be staffed by a team having first-rate qualifications and experience. It should operate with the use of leading edge tools and systems. The Project Management Office, however, lacks a breadth of experience in some skill categories. Efforts to build the needed organization appear to have had low priority across the program's early years.

Resource planning for the AMRP management organization must determine the quality of management the Company needs to employ across the program's life. The program's history indicates that senior management did not begin program work with the correct perception of what a program of this magnitude entails. On an absolute basis, the project's dimensions include, for example, 2,000 miles of pipe to replace, more than \$5 billion in total expenditures in all probability (and maybe significantly more), and a need for a compelling level of management, executive, and board attention for two decades. It dwarfs by comparison any typical Peoples Gas program or initiative. It seems clear that the Company did not understand, and certainly did not respond fully to, the magnitude of the challenges involved in ramping up to very high levels of production and sustaining them across twenty years.

Liberty has not examined and therefore does not draw any negative conclusions about the attention that Peoples Gas has paid to building its internal capabilities through the years. They may have been sound for business as usual. They should not, however, have produced confidence that organizations built for traditional utility projects would sustain a burden vastly greater than that of traditional work. Liberty's work in the electric industry found a similar phenomenon with companies undertaking nuclear plant construction in the 1980s. Peoples Gas cannot go back four

or five years to change how it viewed the challenges of the AMRP. The Company can, however, change for the future. It is essential for Peoples Gas, Integrys, or whoever owns and operates the Chicago gas utility in the future to accept the need for a fundamental revision to thinking about meeting those challenges. The challenges will remain and they may grow bigger as the years pass.

Utilities (and Peoples Gas is no exception) tackling a super-project (which the AMRP certainly is) need to enhance their management capabilities extensively. By definition, internal organizations, designed and built for traditional work, cannot absorb a program far more challenging.

**E.3 A series of staffing decisions (whether explicit or implicit) have constrained the ability to manage the AMRP and to build a reliable, long-term, qualified management team for the program's still long future. (*Recommendation E.3*)**

Peoples Gas' staffing decisions made when moving into the AMRP and during its early years of operation worked against developing a strong management approach and team. A number of AMRP elements warrant substantial improvement in this regard:

- Lack of clear assessment and definition of the skills needed to manage the AMRP
- Lack of a plan to acquire and develop requisite skills
- Lack of a long-term organization philosophy and design
- Failure to recognize the need for very active owner participation in key management positions
- Over-reliance on contractors
- Failure to assign full-time, Chicago-based project management
- Lack of common, single leadership of the planning and execution of program activities that were distributed among the Integrys-led Project Management Office and the Peoples Gas North, Central, and South Shops
- Failure to develop or acquire strong internal program controls skills
- Failure to soundly integrate AMRP with non-AMRP planning, resourcing, and scheduling as they concern field work and supporting services performed by Peoples Gas
- A resulting inability to marshal adequate resources to meet AMRP priorities
- Lack of succession planning for key managers.

**E.4 Peoples Gas lacks a credible plan for the acquisition and development of resources to manage and execute the AMRP. (*Recommendation E.3*)**

Liberty found that program management lacked sound knowledge of the required program skills, numbers of people, and overall capabilities to form a sound program management resource plan. The Company cannot develop such a plan without first identifying needs through a structured review and analysis. The planning process therefore must get underway as soon as possible, with definition of needs being the first step. That process requires a long-term focus to complement short term efforts to fill the most critical positions. The AMRP's length gives it more the nature of permanent organization, which can attract dedicated, high-quality personnel. Identifying and filling personnel needs in a revised AMRP management organization lies among the initiatives that management states are now underway, following discussions that began with Liberty last September.

**E.5 The use of a matrix-type approach to AMRP program management did not prove optimum. (*Recommendation E.4*)**

A program of the size and duration of the AMRP can justify a dedicated set of resources. A matrix-type organization also requires a high level of teamwork and cooperation among participating organizations and a project management team skilled at facilitating and maintaining those attributes. For the AMRP, factors such as these favor a dedicated organization, and a strong project manager approach.

**E.6 The current approach and organization for program management produces too little authority and engagement by internal management resources. (*Recommendation E.5*)**

The AMRP applies substantial resources to project management and Jacobs Engineering has supplied many quality people at Peoples Gas' request. The overall organization and approach selected, however, have not been fully effective. The organization consists largely of Jacobs Engineering personnel, with limited leadership from Peoples Gas. The Integrys full-time program manager directing the work that Jacobs Engineering personnel largely perform was not located full-time in Chicago. This arrangement detracted from the ability to continuously follow and interact with project resources and engage on issues. Other Integrys members of the program management resided on the organization's periphery, not in key leadership roles.

Concern arises from the fact that Peoples Gas has managed the AMRP as a "project"; *i.e.*, treating the program as temporary and its people as engaged in transient assignments. A quality, dedicated workforce will become far easier to build, should Peoples Gas treat the program as it should; *i.e.*, as a massive, long term initiative.

**E.7 Peoples Gas should not limit the use of project managers for AMRP projects to only high risk cases. (*Recommendation E.6*)**

The nature of the AMRP projects makes them complex, expensive, a challenge to coordinate, and difficult to manage. The lack of a single, project management focal point for every substantive project has not served the program well.

## **4. Recommendations**

**E.1 Peoples Gas should complete a full replacement of the plan for management (the Project Execution Plan) addressing all key elements of AMRP management and control. (*Conclusion E.1*)**

A strong basis for the new document exists in the original Project Execution Plan. Liberty believes, however, that adding a more summary-level document to the replacement of the Plan would best serve to gain support and traction. In addition, Liberty recommends that the plan discuss a number of specific processes at a summary level:

- A cost estimating process that establishes a valid cost monitoring base and forecasts with confidence final program costs
- Scheduling that develops realistic schedules at all levels with appropriate details to support engineering, procurement, work planning, construction, and contractor activities

- Resource planning that employs staffing strategies, crew allocation, contractor management, training requirements, and productivity measurements
- A work management process that supports the facilitation of work from design to construction to completion
- A cost management program that promotes a culture of program cost control
- Cost reporting designed to precipitate corrective and improvement actions
- Scope control that identifies potential scope growth to minimize cost and schedule impacts
- Procurement strategies that take advantage of large purchases to obtain favorable pricing and supportive deliveries
- Contracting management that takes advantage of the magnitude and long-term nature of a mega-program to develop beneficial and creative relationships with contractors.

**E.2 Current developmental plans for a new Project Execution Plan should specifically address prior failures and how they will be avoided in the new plan. (*Conclusion E.1*)**

In considering potential reasons for failure of the early plan, Liberty concluded that a lack of sufficient management commitment contributed significantly. The lack of credibility that seems inherent in the failure of the early plan naturally raises questions about management's current commitment to the new initiatives as well. Answering the question of "What is different this time?" thus becomes important in sustaining credibility in the change initiatives underway.

**E.3 Peoples Gas should prepare a long-term AMRP management resource plan that specifically addresses: (a) requisite skills needed both on an immediate and on a longer term basis, (b) current gaps in internal capabilities, (c) the optimum balance of owner versus contractor personnel, (d) acquisition and development of resources, and (e) succession plans. (*Conclusions E.2, E.3, and E.4*)**

This work should adhere to the guiding principle that the AMRP requires and can afford a top tier organization and staff. Liberty does not recommend a "money is no object" approach. Rather, so much money is involved, and the risks and opportunities for savings are so great, that acquiring the best people comprises the best approach for managing risks and pursuing opportunities and thus the most cost-effective option.

In defining skill requirements Peoples Gas should apply high standards. The Company should identify where gaps exist in those skills in the current organization. A simple, but highly effective approach would:

- Identify the standards and levels of capability appropriate for the AMRP
- Identify those areas worthy of analysis; *i.e.*, where a mismatch might exist
- Identify gaps between standards and current capabilities
- Prepare an implementation plan for improvement / upgrade of capabilities

In performing this review, the Company should not just look at specific skills, but instead view existing resources holistically by seeking answers to questions like:

- Do we have people with these skills?
- Are there enough of them?
- Are they in the right positions?

- Do they have the organizational standing to get their job done?
- Do they have the appropriate systems and processes at their disposal?
- Where they have weaknesses, do available and communicated developmental opportunities address them fully?

These questions presume that the existing workforce will continue to have a big role, despite the changes required. The goal is not to replace incumbents. The goal is to develop further the capabilities of existing resources, align them properly, and supplement them with new people where needed. The long-term nature of the AMRP particularly opens incumbent development avenues to a greater extent than programs of shorter duration typically would.

Planning also must recognize the impracticability of staffing certain, highly specialized positions internally, and of staffing less specialized ones internally in the full numbers required. Peoples Gas therefore will continue to face the challenge of optimizing the employee/contractor mix, but should act pursuant to the goal of using the program's length to secure in-house resources in areas where the Company has traditionally relied strongly on contractors.

**E.4 Peoples Gas should move toward a project organization that makes significantly more use of dedicated resources under a strong project manager approach. (Conclusion E.5)**

The nature of the AMRP and the internal relationships among Integrys and Peoples Gas argue against a matrix-type organization and a move toward a "strong" project manager approach. AMRP experience to date further compels a re-thinking of the organization approach. AMRP size, cost, and duration indicate that dedicated resources are appropriate for many functions. There is no reason the AMRP should have to compete for resources or go begging. Having qualified people on hand and focused on this singular priority for the next 15 years presents a superior option from performance, quality, cost, and effectiveness of management perspectives.

The AMRP internal issues also argue for a strong approach to project management and greater use of dedicated resources.

**E.5 Peoples Gas should prepare a specification for a new program management function, correcting the weaknesses in the current process. (Conclusion E.6)**

In designing a new program management organization and process, the following attributes should form a part of the specification:

- *High level, full time, on-site program management:* The large number of AMRP resources in Chicago demands that the program manager and the bulk of the Project Management Office be located there full time.
- *Unquestioned executive support,* whether a strong or weak approach applies: Whatever approach is adopted requires the unquestioned support of executive management.
- *Owner expertise:* To lead, at least guide, or at least actively participate in, all core functions. The level of owner participation can remain flexible, but what stands as critical is reinforcing the perception that the owner leads the effort, and has skills as strong as anyone else on the project. A mere figure-head or peripheral role will not work effectively.
- *Permanent, as opposed to transient, identity:* A project usually has a transient identity, reflecting its comparatively short life and the temporary nature of most positions. That

transient identity places limits on the kind of people willing to work on the project and the kind and number of people that management will hire. However, at a duration of twenty years, the AMRP can hardly be viewed as “temporary.” Acting in accord with a belief that it is, produces a naturally weaker approach to staffing.

- *An integrated organization or not – no halfway:* Peoples Gas has taken a split approach to its role in the program management. Liberty recommends active participation and a strong leadership role for the owner. An integrated organization can accomplish this result. However, doing it halfway, with limited positions, limited owner skills, or limited owner authority, can prove worse than using an organization and a management role completely provided by a contractor. At least in that case, accountability remains clear.
- *Accountability for performance:* Accountability and the ability to enforce it at both the program management and functional levels is important. Accountability for performance will not alone prove sufficient for strong performance but it certainly is necessary.
- *Strong technical and analytical skills in management controls in the Project Management Office:* Strong technical and analytical skills on the part of controls personnel often comprise the greatest asset an executive oversight and program manager can have.

Peoples Gas should test its AMRP organization development plans and activities by providing candid and full answers to questions like:

- To what extent must AMRP compete or beg for resources?
- To what extent does the AMRP have to rely on part-time or non-dedicated resources?
- Are lines of accountability and authority clear?
- Is the owner clearly in charge?
- Is the owner fully involved?

**E.6 Peoples Gas should assign a project manager to most, if not all, AMRP neighborhood projects. (Conclusion E.7)**

Even at the individual level, these non-high-risk projects still tend to have very large scope and size. Liberty’s experience produces the expectation that each would have its own project manager. Compared to typical electric or gas utility projects, they are more complex, expensive, customer-sensitive, and carry local regulatory challenges.



## *Chapter F Table of Contents*

Chapter F: Risk Assessment and Replacement Prioritization.....	F-1
1. Background.....	F-1
a. Replacement Prioritization.....	F-1
b. O&M Savings .....	F-2
2. Findings.....	F-3
a. The Main Ranking Index .....	F-3
b. The “Neighborhood” Approach to Prioritization.....	F-4
c. Data Gathering Systems, Tools, and Resources .....	F-5
d. Risk Ranking Model Operation .....	F-8
e. O&M Savings .....	F-13
3. Conclusions.....	F-13
4. Recommendations.....	F-22

## Chapter F: Risk Assessment and Replacement Prioritization

### 1. Background

This chapter addresses Liberty's review of the related topics of Risk Assessment and Replacement Prioritization. Chapter C: The Peoples Gas Distribution System focuses on overall design of the AMRP, including its use of a neighborhood approach. The specific areas that Liberty's review addressed in this chapter include:

1. Systems, tools, and resources for generating and integrating data required for risk assessment
2. The quality of resulting data
3. How Peoples Gas addresses gaps in that data
4. Accuracy, vintage, and use of key data types (*e.g.*, leaks and soils)
5. Risk models, methods, and factor weighting
6. External factors (*e.g.*, repaving programs, other Company programs, such as meter replacements, meter movement outside) and inspections
7. Methods for identifying and prioritizing infrastructure replacement candidates
8. Consideration of alternatives to replacement
9. Quality of replacement decisions
10. Effectiveness of replacements in reducing leak rates
11. Model updating and consistency with industry practice
12. Short-term optimization of risk reduction versus cost
13. Evaluating upcoming projects to test application of risk assessment and prioritization goals, approaches and methods
14. Judgmental factors affecting/overriding risk model output.

#### a. Replacement Prioritization

The work required to address aging gas infrastructure subject to failure requires a sophisticated approach to the assessment of safety risk. It also requires a structured and comprehensive set of methods for prioritizing repair and replacement efforts. The risk that each component in question presents for public and employee safety must drive prioritization. Chapter C: The Peoples Gas Distribution System addresses the basis for planning AMRP work in a manner (the "neighborhood" or "zonal" approach) that supports efficient replacement of high-risk pipe in conjunction with other operating improvements. Chapter C also addresses the Main Ranking Index, which Peoples Gas uses to address immediately that highest-risk pipe which may not be addressed immediately under the neighborhood approach. This chapter focuses on how determinations of risk occur and what role those determinations play in work prioritization.

The measurement assigned to particular risks should correlate: (a) the likelihood that failure events will occur, and (b) the likely consequences should such failures occur. Regarding the latter consideration, gas transmission mains fall into four classifications, driven by the nature of the areas (generally reflecting the number of people at risk) that might be affected by their failure:

- Class 1: Forest and farm areas, where failures have comparatively much lower likelihood of significant safety consequence
- Class 2: Relatively lower densities of homes
- Class 3: Higher home densities or places of public assembly

- Class 4: Significant numbers of buildings four stories or higher.

Location largely drives potential consequence. A main down even a large city street surrounded by parkland presents different consequences from one running past high-use structures. Likely consequences increase even further if those structures pose barriers to swift evacuation (*e.g.*, an elementary school or a hospital). Equipment configurations also drive consequence. For example, the existence of operable excess flow valves can significantly affect the consequences of pipe failures. They can limit the amount of gas that can escape via a major failure (such as break in the service pipe). It is generally difficult to control the locational determinants of risk, apart from relocation options that may exist from time to time.

The likelihood of failure comprises the other main factor in the calculation of risk determination. The likelihood of failure generally lends itself to greater control. For example, the clearly marked and maintained rights-of-way that often typify transmission corridors reduce the likelihood of hits during third-party excavations. Third-party education and communication programs, facility surveys, proper mark outs, and posting inspectors at work sites also can mitigate this component of risk. More pertinent to the review here, different pipe materials, ages, diameters, and other conditions combine to produce different likelihoods, even within a particular type (*e.g.*, cast or ductile iron) of material. Moreover, the degree of mitigation resulting from various activities (*e.g.*, leak monitoring, repair, and replacement) differs as well.

Companies like Peoples Gas therefore need to conduct periodic risk assessments that measure and combine likelihood and consequence to identify highest-risk facilities and the effects that various forms of mitigation can have on measured risk. Those assessments need to drive prioritization of mitigation efforts and produce the investment (in capital or O&M programs and initiatives) necessary to keep risk at acceptable levels.

Liberty's focus in examining prioritization (and the risk measurement that must underlie it to make it effective) concentrated particularly on overlaying Main Ranking Index-driven replacements on top of the neighborhoods approach addressed in Chapter C. Liberty examined the resulting performance in addressing pipe exhibiting the highest levels of risk. This chapter also addresses details underlying the risk assessment and prioritization processes used to plan work under the neighborhood approach.

#### **b. O&M Savings**

The neighborhood approaches' combination of main replacements with other work (increasing pressures from low to medium levels and the relocation of meters from inside to outside customer structures) will produce future operations and customer benefits. Peoples Gas addressed changes in operations and maintenance costs that it estimated would flow from AMRP work. It did so last in 2009 testimony before the Illinois Commerce Commission. Liberty did not seek to validate or critique that testimony or its supporting modeling and analysis. It was outside of the scope of this engagement.

Liberty did examine the ability on a present and going-forward basis to consider changes in O&M costs as a function of investment in pipe replacement. The examination also included a review of the ability to perform analyses of changes in O&M costs resulting from work undertaken in the

context of the neighborhood approach. This approach combines pipe replacement with other work. This broader examination becomes material, as promoting work efficiency through the neighborhood construct has the potential for affecting the pace at which Peoples Gas eliminates high-risk pipe from its system. Knowing the full “value” (which includes offsets to operations and maintenance costs) achieved through completion of neighborhood work (both pipe replacement and other) might, under certain circumstances, influence the pace of pipe replacement.

Another portion of this chapter also addresses questions of potential balance (particularly over time) between replacements driven by the Main Ranking Index and by the neighborhood construct. Optimizing that balance takes full knowledge and robust consideration of all the advantages produced by alternate approaches, including their operations and maintenance cost effects.

## 2. Findings

### a. The Main Ranking Index

Peoples Gas has employed its Main Ranking Index to prioritize replacements for many years. The Index employs a variety of data to generate replacement rankings. At AMRP inception in 2011, the Index operated as the only prioritization driver of AMRP work. Since the beginning of 2013, it has operated in parallel with the zonal, “neighborhood” approach to planning and scheduling replacement work under the AMRP.

Peoples Gas uses the Main Ranking Index to give each distribution and transmission system segment a numbered risk ranking. Higher numbers reflect higher risk. Annual application means that a segment’s rankings can, and some do, change each year.

Rank calculations use an equivalent likelihood of a main break. Breaks create the principal safety risk of low-pressure, cast iron mains. Ductile iron mains suffer from a similar failure event. The likelihood of main breaks increases as main diameters decrease; *i.e.*, smaller-diameter pipe is more likely to break. Soil type and construction in proximity to pipe can also affect the likelihood of breaks. The Main Ranking Index accounts for a range of break-risk factors, including numbers of breaks, cracks at taps, visual observations of cracks, pipe coupon equivalent breaks, and main repairs adjusted to breaks. Peoples Gas has gathered data about its gas system for use in the Main Replacement Index since the Company began using it about 20 years ago.

Each break-risk factor has an equivalence rating, used to determine the likelihood it will break. The relevant factors undergo correction for environmental conditions. The amount of paving and location in a business district with building-to-building paving are among these corrections. Peoples Gas standardizes index results to city-block lengths of 660 feet. This standardization accounts for the fact that discretely-captured pipe segments can range from a foot to a mile in length.

The Company replaces segments ranked six or higher within a year, irrespective of whether such replacement would coincide with the schedules developed under the AMRP’s neighborhood construct. Peoples Gas also replaces some segments ranked at level five within a year. They include the segments in proximity to buildings of public assembly (“BPAs”) whose conditions or occupants limit quick evacuation (*e.g.*, schools, churches, day- and elder-care facilities, prisons).

Peoples Gas does attempt where practicable to schedule “neighborhood” work (upgrades to medium pressure and relocating indoor meters to outside locations) to coincide with the segments requiring replacement within a year. The presence of medium-pressure mains in the neighborhood involved serves as a major determinant of the ability to do so. In any event, where combining priority replacements with other work is not practicable, Peoples Gas makes the replacements with substitute materials “like-for-like,” based on physical size and pressure.

Use of the Main Ranking Index model requires up-to-date information about preceding-year retirements and main replacements. Peoples Gas adds this new data in re-computing segment Main Ranking Index scorings every year. The Company also runs the calculations that prioritize work on a neighborhood basis each year. After starting work in a neighborhood, however, it continues until completion regardless of whether the succeeding year’s calculations change its relative ranking. A significant movement of other neighborhoods up in the list, could, however, cause adjustment of the schedule for a neighborhood requiring multi-year phasing.

The numbers of main segments replaced because they ranked six (or five in specified cases) has remained stable. About 10 segments come onto the list each year, as ten ranked from last year get removed by virtue of being replaced. The Main Ranking Index underwent an Illinois Commerce Commission-mandated review by an independent consultant in the mid-2000s. This review found Index-driven replacements appropriate, given declining rates of cast iron main breaks.

#### **b. The “Neighborhood” Approach to Prioritization**

The second, neighborhood (or zonal) method of replacement-work prioritization came into existence in 2012 for work performed during the 2013 construction season. Its introduction sought to increase the efficiency of capital work by combining high-risk pipe replacement with: (a) upgrades to medium pressure, and (b) relocating customer meters from inside buildings to outside. By 2014, the neighborhood approach had come to drive most of the main and service replacements. Main Ranking Index level six and partial level five replacements still operate as an override to work scheduled under the neighborhood approach.

Peoples Gas uses a 228-neighborhood Chicago division to prioritize and plan work. The neighborhood construct also uses risk ranking to prioritize neighborhoods. The large size of many of the more than 200 neighborhoods has led Peoples Gas to break work in them into phases. It takes more than one construction season to complete work in these neighborhoods. A ranking structure for the phases considers a number of attributes that can cause failures. The driving factors that Peoples Gas considers material include:

- A belief, based on past experience, that mains installed prior to 1920 (the oldest system components) have the highest likelihood of failure
- Services installed or renewed prior to the advent of mandated cathodic protection also have high failure risk
- Areas that have already experienced high failures are prone to do so in the future
- High- or medium-pressure cast iron or ductile iron feeder mains have a higher consequence of failure

- Small-diameter cast iron mains fail at a higher rate than do large-diameter mains. (Other operators share this observation.) Their thinner walls provide less protection from cracking when undermined or graphitized.

Peoples Gas therefore applies to each neighborhood a ranking determined by a set of specific factors. Each neighborhood's ranking predominantly drives its priority ranking under the neighborhood construct. Unlike the segment-specific Main Ranking Index approach, an entire neighborhood gets a single rating. This rating reflects the collective condition of its infrastructure. Subject to the Main Ranking Index overlay, this neighborhood ranking also predominantly drives its priority for main and service replacement.

External factors can provide a source of moderate adjustments to the scheduling of work in the highest-ranked neighborhoods. The same applies to some extent to Main Ranking Index-driven work as well. Peoples Gas takes into account city, state, and other utility infrastructure improvement plans when scheduling its infrastructure work. Street repaving schedules also have an impact. Peoples Gas cannot obtain permits to work in a newly-paved street unless it will repave the entire street. Short-term rearrangements among the highest-priority neighborhoods or replacements occur as required to account for such external factors.

### **c. Data Gathering Systems, Tools, and Resources**

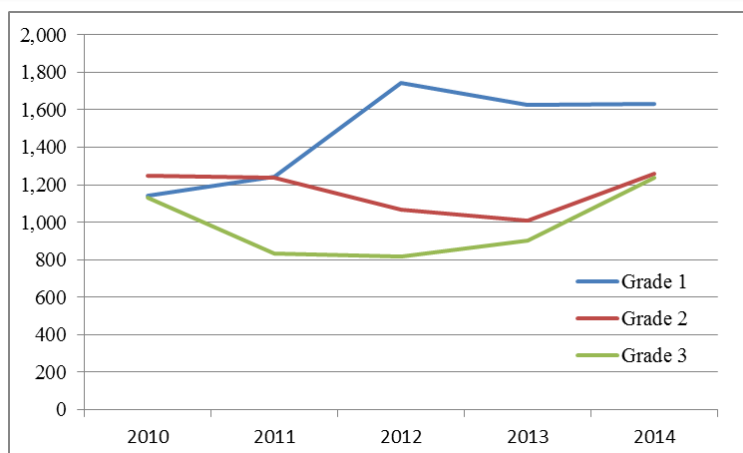
#### *i. Leak Tracking*

Peoples Gas has employed a leak-tracking system since the mid-1970s. The Company also employs long-standing systems to manage property records that address main and service locations, replacements, construction materials, size, and other parameters. Peoples Gas integrated data from these systems into the Main Ranking Index in the 1990s. Additional refinements to include mapping leaks on geographic-information-system-type models, which makes tracking and inquiries less labor-intensive. The knowledge of leak experts in each of the three Shops into which Peoples Gas divides its field operations supplements property records and leak histories.

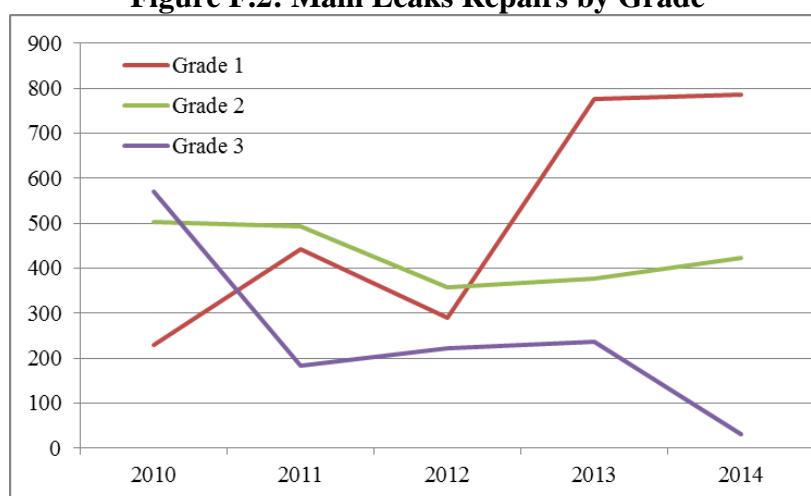
#### *ii. Capturing Leak Data*

Companies must provide leak data to the U.S. Department of Transportation's Pipeline and Hazardous Materials Administration ("PHMSA"). Peoples Gas has been using computer and automated programs to capture leak data for many years. These programs assign a leak identification number, and then schedule follow up measurements based on Company procedures and regulatory requirements. Leak tickets track repair activities. Work orders track costs and associated work. Minor gaps due to issues such as the time between leak discovery and repair always exist. Prior audits, however, demonstrate that Peoples Gas tracks leaks with sufficient accuracy. Grade/Type 1 leaks require immediate repair, for example, while Grade/Type 2 leaks may be held for future repair, and Grade 3 leaks must be surveyed with no requirement for repair. The next two graphs show the number of leaks discovered and repaired in recent years.

**Figure F.1: Main Leaks Received**



**Figure F.2: Main Leaks Repairs by Grade**



Liberty examined several different leak data tracking sources. This review disclosed significant differences in the number of Type (or grade) 1, 2 and 3 leak totals. Liberty could not reconcile differences in various reports about leaks. Re-grading of leaks often produces mismatches, but these differences could not be explained away completely by concluding that Peoples Gas changed some leaks to a lesser grade or type. The differences appear too substantial to be explained by re-grading leaks to non-hazardous classifications.

### *iii. Planned Infrastructure Work by Others*

Peoples Gas compares Main Ranking Index and neighborhood modeling outputs against planned work by other government and utility entities. This comparison permits adjustment of program work schedules as needed. City of Chicago requirements have caused Peoples Gas to choose to place new mains on both sides of the street. This requirement generally necessitates the use of the “parkway” or sidewalk corridors. Thus, city-street construction *per se* does not present an overriding factor. However, intersections, where gas mains may require relocation because of conflicts with new water or sewer lines, become a more important factor.

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*iv. Soils Data*

Soils can play an important role in determining comparative rates of cast iron pipe degradation. Soils should factor into risk modeling. We found no indication that Peoples Gas information directly or judgmentally considers soil condition as part of the Main Ranking Index or neighborhood rankings.

The lack of soils data has more consequence for the Main Ranking Index than for neighborhood rankings. Liberty considers soil type a break-risk factor. One can expect the Company's highly localized, individual pipe segments that comprise fundamental units of the Main Ranking Index to lie in relatively uniform soil types. The presence of unstable soils could and should be considered a risk factor for each segment is evaluated under the Main Ranking Index. The wide areas encompassed by neighborhoods likely produce less homogeneous soil conditions. This factor makes soil condition a less pertinent factor in ranking them.

*v. Addressing Erroneous and Missing Data*

Peoples Gas sometimes lacks material data, such as the exact location of a service line to its customer or the facilities of another utility. It requires contractors in such cases to locate underground facilities by digging test holes. This practice sometimes proves inefficient. Peoples Gas has found it more effective, however, than placing special crews on standby to perform custom locating, or using high-tech locating devices.

For directional drilling, Peoples Gas requires contractors to locate sewer mains and laterals via video-camera examination. Following drilling, but before new main activation, another video examination must take place. This video verification supplements test holes and other locating efforts (*e.g.*, marking services and mains on the surface).

Contractors have found main and service location errors on some Peoples Gas maps that show locations by using property lines. Peoples Gas has adopted a program to address such errors. It consists of locating all new and newly-retired mains and services on updated maps. Liberty's inquiries did not disclose the existence of a structured, controlled method for ensuring timely correction.

Liberty examined the Company's use of assumptions to account for missing data. Particularly for older, large urban systems, missing data presents an unavoidable problem. Liberty did not find broad needs to make assumptions to account for missing data. The use of neighborhood-wide rankings tends to marginalize the impact of data errors on individual segments. The primary need that Liberty observed occurs in determining the ages of particular segments, and particularly for use in ranking under the Main Ranking Index. Peoples Gas makes an appropriately conservative assumption of pre-1920 installation when it cannot verify an actual date.

Errors with respect to leak and break locations could have a material impact on Main Ranking Index rankings. Liberty knows no practical way to address old, untraceable data, however. The existence of multiple leaks would diminish concern about a missing record of a single leak, or about recording visible cracks during an inspection. With respect to missing environmental factor data, Google Maps offers a means for checking. Except for failing to consider soils data in the



Main Ranking Index, Liberty found no substantial concern about the ability to use existing data and to apply reasonable assumptions to feed models driving replacement prioritization.

Peoples Gas rounds Main Ranking Index scores to the nearest 1/4 point. This feature has significance in connection with the “must repair” status of all segments that achieve a ranking of at least six and a defined portion of those that achieve a ranking of 5. Rounding up, for example, to make a score of 4.88 become 5.0 and a score of 5.88 become 6.0 would include a level of conservatism into the rankings.

*vi. Locating Services*

The Company uses property line measurements to locate new services. It plots them in the geographic information system. The principal difficulty in using this approach arises when property line data associated with old services proves inaccurate. One of the three Peoples Gas Shops addresses this issue by requiring meter markers (when they locate the installation point for new meters) to locate on a drawing and sometimes on the property where the old service penetrates the foundation. This practice should increase success in finding the location of the old services. The lack of accurate locations for some existing service lines has caused some contractors to make large excavations in the parkway and sidewalks. That response increases the costs of main and service installations and restoration over the long term. The marking practice of the one Shop should be communicated to the other two as a best practice.

**d. Risk Ranking Model Operation**

*i. The Main Ranking Index*

The Main Ranking Index’s algorithm uses a number of factors to calculate an Index score (“MRI”). Several factors determine an equivalent crack number, which then undergoes adjustment to a standard segment size equivalent to one typical city block (660 feet or so). The depiction below sets forth the equation used to calculate an MRI, which then gets rounded to the nearest 0.25 to determine the Main Ranking Index.

Figure F.3: Main Ranking Index Algorithm

$$\text{MRI} = \text{B} + \text{C} + \text{VPE} + \text{KU} + \text{RE}$$

Where:

**B** = Break equivalent based on breaks.  
**C** = Break equivalent based on cracks at taps.  
**VPE** = Break equivalent based on visual observations of the main.  
**KU** = Break equivalent based on pipe coupon analysis on the segment.  
**RE** = Break equivalent based on repairs done on the main  
Each of the above components is then broken down with various attributes.

**B = K1 \* B1 \* MR20**  
*(Analysis includes number of breaks, operating pressure, street classification (business versus residential), and pavement coverage multiplied by a Break Equivalent Factor.)*

**C – Break Equivalent Based on Cracks at Taps:**  
*(Analysis includes number of cracks at taps, operating pressure, street classification (business versus residential), and pavement coverage multiplied by a Break Equivalent Factor.)*

**VPE – Break Equivalent Based on Visual Observations of the Main:**  
*(Analysis is based on a visual inspection ((Poors versus Goods) (or coupon analysis if available)) and also takes into account material, operating pressure, main size, street classification (business versus residential), pavement coverage multiplied by a Break Equivalent Factor.)*

**KU – Break Equivalent Based on Pipe Segment Coupon Analysis:**  
*(Analysis includes physical evaluation of material condition, operating pressure, street classification (business versus residential), and pavement coverage multiplied by a Break Equivalent Factor.)*

**RE – Break Equivalent Based on Repairs Performed on the Main Segment:**  
*(Analysis is based on a visual inspection (Poors versus Goods) and also takes into account material, operating pressure, main size, street classification (business versus residential), pavement coverage and (or coupon analysis if available) multiplied by a Break Equivalent Factor.)*

Other factors applied address operating pressure, whether a coupon has been taken, and whether inspections have been performed. Numerical values for all factors get added together. The next figure shows a recent (August 2014) run of the Main Ranking Index model. The figure presents all of segments having a ranking of 6 or more. This run produced some interesting features (note the shading):

- It tends to confirm the small-diameter cast iron factor (11 of 12 entries)
- It tends to diminish the significance of pre-1920 construction (6 of 12 entries).

**Table F.4: August 2014 MRI Model Result, Segments with Ranking >6**

ID	SIZE	MATERIAL	PRESSURE	CORROSION FAMILY	YEAR	LENGTH	MRI
16845	6	CI	MEDIUM	0000000000	1956	25	12
1016898	6	CI	LOW	0000000000	1913	7	10.71
1000171	6	CI	LOW	0000000000	1924	2	7
87446	6	CI	LOW	0000000000	1902	607	7
42552	6	CI	LOW	0000000000	1910	569	6.78
25732	6	CI	LOW	0000000000	1937	763	6.64
79084	6	CI	LOW		1938	577	6.23
5653	6	CI	LOW		1924	626	6.15
6711	6	CI	LOW	0000000000	1917	210	6.05
43811	6	CI	LOW	0000000000	1913	595	6
1003792	12	CI	MEDIUM	0000000000	1953	434	6
1032641	6	CI	LOW	0000000000	1902	496	6

At present, the Main Ranking Index cannot and does not operate on a probabilistic basis. Probabilistic models use long-term histories of all main-failure events, and total understanding of the environment of mains and services, in order to develop probabilities of particular failures. Probabilistic models may prove more efficient in programming high-risk main replacements, but the amount of data they require entails significant time and cost. Moreover, some of the data may not be available. Thus, such models, to Liberty's knowledge, have not yet been used for main-replacement risk assessment and prioritization.

*ii. Neighborhood Modeling*

The next table shows the criteria weightings for rankings under the construct used to prioritize combined high-risk pipe replacement, medium pressure upgrading, and meter moving work in the designated 228 neighborhoods.

**Table F.5: Neighborhood Criteria Weights**

Criterion	Weight
MP Ductile iron Main	25%
8-Inch or Smaller CI Main	25%
CI Main Older than 1920	15%
Unrepaired Leaks	20%
Inside Meter	15%

The algorithm directly applies these criteria to determine neighborhood rankings, as the next depiction shows.

**Table F.6: Neighborhood Ranking Algorithm**

**Ranking** = [(MP DI Main Rank)\*0.25] + [(8" or smaller CI Rank)\*0.25] + [(CI Older than 1920 Rank)\*0.15] + [(Unrepaired Leaks Rank)\*.020] + [(Inside Meters Rank)\*0.15]

The Company also tracks “at risk” services (unprotected steel, clear plastic, copper) to determine how many to replace. Peoples Gas seeks to reduce the number of problematic low pressure regulators by eliminating them when a neighborhood transitions to medium pressure.

Work planning divides each neighborhood into a number of more manageable phases where required by dimensions and work requirements. The construction order of these phases considers:

- Availability of medium pressure
- Whether other contemporaneous infrastructure work necessitates moving the gas main
- Whether there is a planned repaving project.

The ability to combine AMRP work with other planned construction may accelerate work compared with what its risk ranking would otherwise indicate. Planning also seeks a degree of work levelization among the three Shops. Levelization seeks representative levels of work progress across the City, and avoidance of work overloads in a particular Shop. Preliminary work plans under the neighborhood approach to planning use five-year windows. Adjustments, mindful of minimizing out-of-priority-order work, then occur based on cross-checks against third-party plans.

The numbers of leak-prone services do not affect a neighborhood’s ranking. Peoples Gas does, however, track and replace such services as part of the work under the neighborhood’s plan and schedule. The transition to medium pressure and the relocation of meters outside as part of neighborhood work supports efficient replacement of leak-prone services (bare or unprotected steel, clear plastic, and copper).

The following table shows the results for the initial five-year replacement plan.

**Table F.7: Five-Year Replacement Plan Results**

<b>2014 - 2018 Summary</b>				
<b>Shop</b>	<b>Neighborhood</b>	<b>Main Retired (feet)</b>	<b>Number of Services</b>	<b>Vulnerable Services</b>
<b>North</b>	6	1,213,766	34,488	5,726
<b>Central</b>	5	793,954	21,674	1,600
<b>South</b>	6	908,904	23,407	2,055
<b>Total</b>	<b>17</b>	<b>2,916,624</b>	<b>79,569</b>	<b>9,381</b>
<b>2014 - 2018 Breakdown</b>				
<b>2014*</b>				
<b>North</b>				
	Portage Park (10 phases)	180,365	2,783	1,664
<b>Central</b>				
	South Austin (14 phases)	127,776	3,378	601
<b>South</b>				
	South Shore	203,280	4,273	344
<b>Total</b>		<b>511,421</b>	<b>10,434</b>	<b>2,609</b>
<b>2015*</b>				
<b>North</b>				
	Portage Park (7 phases)	178,464	6,388	1,690
<b>Central</b>				
	South Austin (14 phases)	168,725	3,647	
	Brighton Park	121,440	3,988	
<b>South</b>				
	Beverly	169,597	3,821	316
<b>Total</b>		<b>638,226</b>	<b>17,844</b>	<b>2,006</b>
<b>2016</b>				
<b>North</b>				
	Jefferson Park (Part 1)	158,815	4,801	728
	Albany Park	134,924	3,825	516
<b>Central</b>				
	West Englewood	167,975	4,924	
<b>South</b>				
	South Chicago	171,962	4,965	486
<b>Total</b>		<b>633,676</b>	<b>18,515</b>	<b>1,730</b>
<b>2017</b>				
<b>North</b>				
	Belmont Central	143,964	5,186	1,128
	Jefferson Park (Part 2)	158,815	4,801	

<b>Central</b>				
	West Town	121,289	2,693	211
<b>South</b>				
	Englewood	171,962	4,965	575
<b>Total</b>		<b>596,030</b>	<b>17,645</b>	<b>1,914</b>
<b>2018</b>				
<b>North</b>				
	Logan Square	199,666	5,505	
	Old Irving Park	58,753	1,199	675
<b>Central</b>				
	Gage Park	86,750	3,044	788
<b>South</b>				
	Back of the Yards	50,913	1,536	334
	Morgan Park	141,190	3,847	
<b>Total</b>		<b>537,272</b>	<b>15,131</b>	<b>1,797</b>

\*Based on 100% design

### e. O&M Savings

Peoples Gas has confirmed that it does not have current data or analysis addressing how operations and maintenance costs have recently changed or would change as a function of investment in pipe replacement. The Company confirmed that it incorporated the most recent such data and analysis in its 2009 testimony before the Illinois Commerce Commission.

That testimony came in support of a then-proposed acceleration of the replacement of leak-prone pipe. The analysis presented at that time addressed two scenarios (Scenarios 2 and 3). Scenario 3 reflected a 20-year AMRP; Scenario 2 reflected a “business as usual” pace that would complete the replacement of leak-prone pipe much later. Any flaws that analysis may have had have been rendered moot by changing conditions. Peoples Gas has agreed to the development of a cost model for analyzing the costs associated with the AMRP program. The Company intends that this model include the capacity to address not only investment costs, but also those associated with operations and maintenance.

## 3. Conclusions

### F.1 Peoples Gas has substantially changed the nature of pipe replacement activities over what is now a long period of addressing the need.

Over the last 20 years Peoples Gas has used several methods to determine how to replace mains in the most cost effective manner. Early methods relied solely on highest Main Ranking Index scores, in an effort to address the highest risk mains each year. The Index yielded a comparatively small amount of mains to be replaced in 2004, as the next chart demonstrates.

**Table F.8: Evaluation of Main Segments Based on Main Ranking Index**

MRI Interval	Number of Miles									
	Jun-95	Oct-96	Oct-97	Oct-98	Oct-99	Oct-00	Oct-01	Oct-02	Oct-03	Oct-04
20 & Above	0.2	0	0	0	0	0	0	0	0	0
10 to 19.75	2.3	0.9	0.1	0.1	0	0	0	0.1	0.2	0.1
6 to 9.75	10.0	4.2	3.1	1.3	0.9	0.6	1.1	0.8	0.9	0.4
5 to 5.75	9.1	6.9	5.7	5.5	4.4	4.4	5.0	3.9	4.9	4.9
4 to 4.75	20.5	16.4	16.8	15.9	15.5	17.0	14.9	14.3	15.3	15.1
3 to 3.75	45.5	34.9	38.3	39.0	42.7	41.8	42.6	41.2	41.5	43.0
.25 to 2.75	995.1	1,044.5	1,082.8	1,092.6	1,097.1	1,102.0	1,083.5	1,064.9	1,055.8	1,047.2
0	2,948.5	2,907.3	2,855.2	2,848.0	2,842.2	2,835.7	2,875.2	2,915.6	2,910.9	2,936.5
<b>Total</b>	<b>4,031.2</b>	<b>4,015.1</b>	<b>4,002.0</b>	<b>4,002.4</b>	<b>4,002.8</b>	<b>4,001.5</b>	<b>4,022.3</b>	<b>4,040.8</b>	<b>4,029.5</b>	<b>4,047.2</b>

Starting in 2004 additional considerations led to the replacement of about 44 miles, excluding system expansions. It foreshadowed the neighborhood method insofar as it targeted areas for replacement while attempting also to upgrade pressure. In 2010, an expanded Capital Optimization Program, or COP, began. This program added consideration of nearby public improvements and risk-prone services, and calculated the resulting savings from existing and future leaks and work. It considered small-diameter, old cast iron installed prior to 1920.

Peoples Gas decided to implement the parallel operation of the neighborhood and Main Ranking Index rankings and drivers of replacement projects in 2012/13. Enlargement of the neighborhood model and breaking neighborhoods into phases sought to obtain economies of scale and promote more effective work planning. Those changes have improved the efficiency of performing replacements, and have well served conversion to medium pressure.

## **F.2 The neighborhood approach offers a sound construct for efficiently replacing high-risk pipe, while contemporaneously increasing the delivery pressure and moving meters outside.**

The neighborhood construct permits main installation and conversion to medium pressure without having lengthy interruptions in service. It allows build-out of medium-pressure infrastructure, while low-pressure mains remain in service until the Company can switch all customers served from a main to medium pressure. This approach may defer retirement of some old, low-pressure system components, but it ensures that all customers have gas service almost continuously. Short-duration outages may occur while Peoples Gas ties in a new outside meter, but these outages should be minimal in duration.

Before moving to the neighborhood construct, Peoples Gas would find itself, when undertaking replacement of high-risk pipe, possibly extending medium-pressure feeds deep into areas without the ability to tie customers into them. Deferring the work necessary to make those connections not only forced customers to wait for medium-pressure service, it also substantially increased costs by requiring eventual tie-ins to occur under an entirely separate installation process.

Past reliance solely on the Main Ranking Index to drive replacements also tended to produce widely scattered and more isolated work. That also increased costs, when compared with a program encouraging work that the Company could more economically perform through commonly marshalling resources and equipment to work more pipe in the concentrated area achievable under the neighborhood approach.

**F.3 There is no clear indication that data inadequacies threaten proper prioritization, but Peoples Gas lacks a data quality control function that exposes its risk modeling to potential sources of error. (Recommendation F.1)**

Peoples Gas does not appear to have a data quality control program in place to evaluate current or past data. Such a program makes sense under normal circumstances, and has greater importance given the importance and magnitude of the work that will engage Peoples Gas for many years to come. The three Shops were addressing data issues, but did not seem to share best practices.

Reports showing differing leak totals provide one example of data inconsistency that Liberty's examination uncovered. Liberty could not reconcile leak totals to determine a single, reliable number of leaks and leak rates of Grade/Type 1 and 2. This difficulty raises the question of how Peoples Gas determines them. The large differences appear to negate the otherwise likely conclusion that differences result from timing or leak re-grading issues. The material variances in data provided to Liberty addressing similar measures do not have clear and logical explanations.

Liberty found no clear indications that quality and completeness of data used for risk modeling and replacement prioritization are fundamentally unsound. A structured assessment of gaps and potential consequences is nevertheless warranted to assure that risk models continue to operate effectively. However, Peoples Gas does not operate a structured program for validating data after its entry into the systems that feed the prioritizing models.

Each of the relative risk models uses historic records and property records to determine the most at risk segments or neighborhoods, based on the each model's requirements. Many, particularly older, records are likely to be missing, as is the case generally for utilities serving large cities with extremely old infrastructure. The breadth of the ranking models and the wealth of data available to populate them moderates the risks of inaccuracy. Peoples Gas has been populating data for use in replacement prioritization for decades.

Another factor that mitigates concern about data completeness and accuracy is the rounding feature of the Main Ranking Index. This feature serves to heighten the priority (six and above and some five ranked segments) of the facilities requiring immediate replacement whatever their ranking might be under the neighborhood construct.

**F.4 Not including soils data in risk modeling fails to address a factor material to failure risk. (Recommendation F.2)**

Peoples Gas does not appear to be using soils data in either risk model. Such data should be considered in differentiating the risk of corrosion and breaks, even within particular classes of high-risk pipe. Soils data is important for locating potential areas of high corrosion, and thus wall thinning of mains. Currently neither risk model used by Peoples Gas appears to use soils data in developing risk rankings. This data may not be as useful in the neighborhood model, which



identifies replacements on a large-area basis. The data has more applicability for “hot spots,” where corrosion proceeds at accelerated levels.

**F.5 Despite the improvements that replacement has brought, the failure to achieve a decrease in leaks raises questions about effectiveness in identifying the highest-risk pipe and slating it for replacement. (*Recommendations F.3 and F.4*)**

The failure of leaks to trend significantly downward for a number of years calls into question the process used to select highest-risk mains. After so many miles of main replacement, one would anticipate a large reduction in leaks. The data simply do not show such reductions. Even after considering Company adjustments for third-party damage leaks and normalizing for degree days, Peoples Gas has experienced only a nominal reduction in hazardous or potentially hazardous leaks (Grade/Type 1 & 2) over the last several years. Several outside consultants have concluded that the Company measures the correct parameters. That conclusion points to the weightings being used in the models that drive replacement as a subject for evaluation. The Main Ranking Index model weightings have not changed over a number of years.

The neighborhood ranking calculation significantly weights the amount of small diameter and pre-1920 pipe in each neighborhood. It thus tends to favor larger over smaller neighborhoods, with all else being equal. The combined amount of small diameter and pre-1920 pipe comprises a full 40 percent of the neighborhood risk ranking. This emphasis causes the initial selections for work in each shop area (in the first five-year program increment) to consist primarily of the largest neighborhoods in each shop area. The selected areas also include those neighborhoods that have not had many replacements, because the miles of pre-1920 small diameter main remaining is the largest driver on the ranking scheme. Medium pressure ductile iron mains get the next-largest weighting. Meanwhile, unrepaired leaks and inside meters contribute the least to neighborhood risk rankings. Neighborhoods with the highest leak rates may fail selection for the first five-year window simply because they are physically small, do not contain a large percentage of pre-1920 cast iron mains, or do not have much small diameter main.

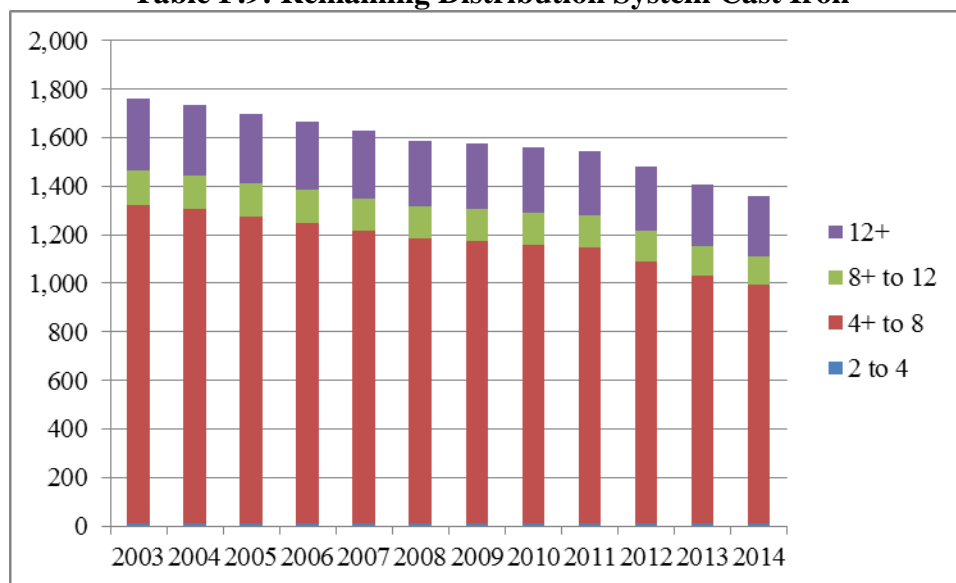
Leak rates fell in the early years of cast and ductile iron replacement. The pace of reductions were consistent with a conclusion that considerable reduction in risk was occurring. A downward trend continued following the introduction of the Main Ranking Index in the mid-1990s. The risk reduction line has now flattened (or slightly increased), even as more leak prone and higher risk segments undergo replacement.

The current risk models continue to target what certainly used to comprise the highest risk segments; *i.e.*, small diameter pre-1920 cast iron segments (due to their highest break potential). The once considerable amounts of such pipe, especially the smallest diameters, however, have fallen considerably, as replacement programs have continued to target them. A going-forward replacement rate of over 100 miles per year will continue their rapid elimination. However, the reduction in risk that each mile replaced from here forward will produce will continue to diminish, if one makes the logical assumption that the remaining segments pose less failure risk than those already replaced.

Cast and ductile iron remain at far greater risk of failure than do modern materials, such as plastic and cathodically-protected steel. At the same time, elimination of the most risky cast iron and

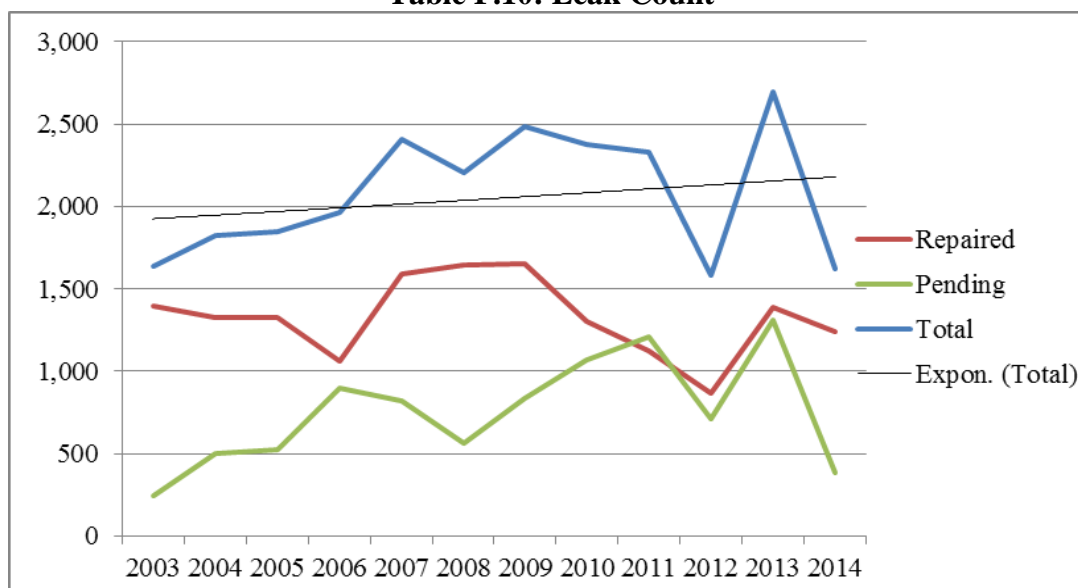
ductile iron segments reduces their risk relative to other system components. Note that the number of mains scoring near 6 under the Main Ranking Index continues to decrease. That number currently consists of less than 20 segments and less than 1 mile of mains. Between 2003 and 2013, the number of miles of small-diameter (8" and less) cast iron main decreased from 1,323 miles to 1,032 miles (22 percent in 11 years). The next table (from PHMSA yearly reports) shows the miles of cast iron remaining in the distribution system at year-end.

**Table F.9: Remaining Distribution System Cast Iron**



The same source, adding both repaired main leaks and leaks pending/scheduled for repair, shows that the overall leak count has not decreased significantly over the same 11 years.

**Table F.10: Leak Count**



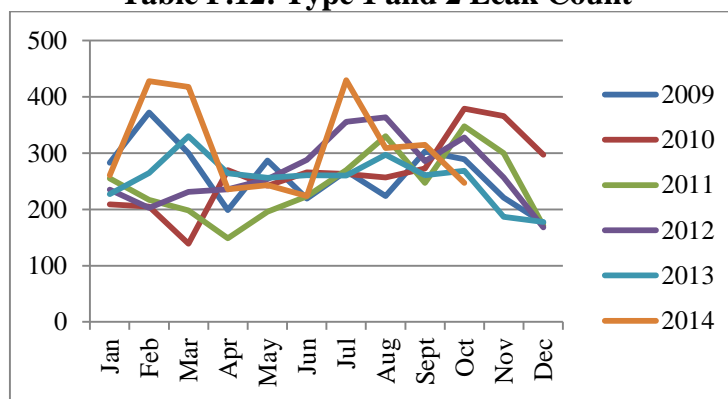
The numbers of repaired and pending-repair leaks in the annual reports show that the number of repaired leaks either has remained constant or slightly decreased. Nevertheless, the number of leaks pending repair has increased. Several possible explanations for decreases in repaired leaks exist (*e.g.*, avoiding repairs mains scheduled for replacement, deferral of repairs to reduce O&M costs). It could also be that the overall leak rate has increased to the point of overwhelming the resources that do the repair work, in which case the backlog is growing. Liberty believes that finding the appropriate explanations for the failure of leak rates to decline should be a priority for AMRP management. Given the level of replacement activity, an increase in explosion or fire incidents caused by leaks would be unacceptable.

An examination of Peoples Gas monthly Type 1 and 2 leak reports for the last several years shows that leaks rates have not decreased as anticipated.

**Table F.11: Annual Number of Hazardous or Potentially-Hazardous Leaks**  
(2014 extrapolated based on 10-months data)



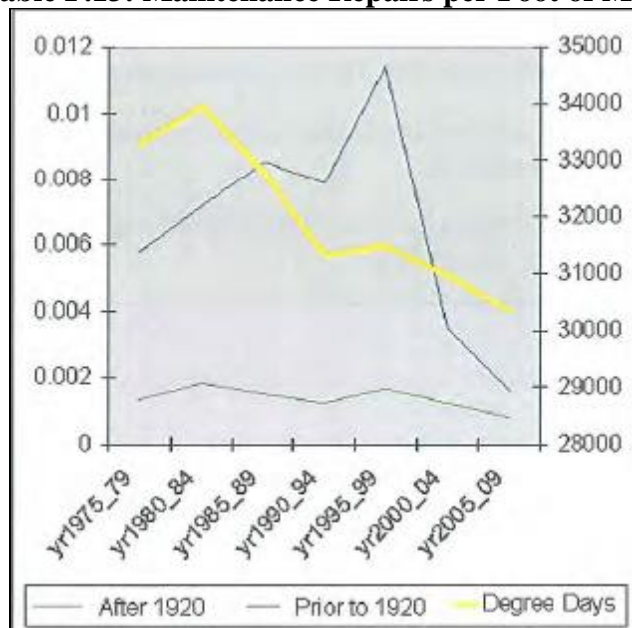
**Table F.12: Type 1 and 2 Leak Count**



Based on data that the Company has supplied, leak costs per mile of cast iron/ductile iron main have been trending downward for several years. The chart below shows that trend by plotting maintenance repairs per foot of main, separated into pre- and post-1920 vintages. During this same period, Peoples Gas relied only on the Main Ranking Index to determine replacement priorities. The neighborhood models targeting pre-1920 main should cause this trend to continue.

Showing degree days demonstrates that weather may account for part of the trend. Warmer winters tend to reduce leak numbers, and therefore repairs. Colder winters with deeper frost penetration may, on the other hand, accelerate leaks due to breaks. The 2013/2014 winter was one of the coldest in recent times, which may account at least in part for an uptick in leak rates then.

**Table F.13: Maintenance Repairs per Foot of Main**



**F.6 The weight given to pre-1920 main may no longer support greatest risk reduction per mile replaced. (Recommendations F.3 and F.4)**

Leak rates for pre-1920 cast iron mains decreased steadily and substantially from 1995 through 1999. By contrast, those rates have remained essentially flat during from 2010 through 2013. Hazardous leaks (Type 1) have increased, but declines in non-hazardous leaks (Type 3) have essentially offset the increase.

A number of factors complicate reaching definite conclusions about causes of leak-rate changes in the past ten years or so. The number of miles replaced in more recent years decreased, with uncertainty about rate recovery. Most recently, the extreme cold of the 2013/2014 winter brought increased frost-cracking potential for brittle cast iron mains. Peoples Gas still replaces segments having a Main Ranking Index ranking of 6 or greater (and 5 for certain conditions). The rankings that drive neighborhood work tend to emphasize small mains installed prior to 1920, because they are the most leak-prone.

Peoples Gas last commissioned a focused review of its risk-ranking effectiveness in 2007. The outside firm conducting the review observed continuing leak reductions, and discussed the merits of examining a date of 2038 or later for replacement completion. A fundamental premise of the finding of effectiveness at that time has no longer applied for a number of years. Liberty believes it is time to re-examine the weightings used to rank risk. In particular, the Company should consider the weight that small-diameter, pre-1920 cast iron mains should receive.

Pre-1920 and post-1920 main repair rates are approaching each other. Targeting pre-1920 cast iron main for replacement may not be yielding the largest reduction in leak rates. Rather, leak history in a neighborhood may offer a prioritization criterion for main replacement neighborhoods. Normalizing leaks, both repaired and open, per the number of feet or miles of main to be replaced in each neighborhood would also tend to produce the greatest reduction in risk per foot replaced.

**F.7 Peoples Gas does not employ a meaningful metric that can directly relate costs expended to risk mitigation accomplished; Liberty continues to work with the Company to determine one. (Recommendation F.5)**

Liberty examined the potential for identifying a metric that could directly and simply address effectiveness in identifying: (a) the right mains and services to replace, and (b) cost-effectiveness of replacements in relation to that identification. Such a metric would measure cost-effectiveness in terms of success in risk mitigation produced. Peoples Gas does not use such a metric. The recommendation implementation monitoring process that will follow this report should include efforts to develop such a metric.

A primary difficulty in defining a meaningful metric arises from the time lag between installation of new mains and retirement of the mains being replaced. Lags approaching one year can occur. For example, before retiring the old main, Peoples Gas must move all customers to a new, higher-pressure main. Thus, delays in locating and installing a few - perhaps even one - new meters delays retirement. The accounting process also delays recording retirements already physically accomplished. Updating property and tax records produces discontinuity in measuring the effects of replacement work.

**F.8 A review of upcoming projects confirms that Peoples Gas does use the results of its two ranking systems to prioritize work on what those systems identify as highest-risk.**

Liberty examined 2015 planned replacement projects to test their conformity with the neighborhood ranking process that Peoples Gas uses to select them. The next table lists 2015's major neighborhood replacement projects. Many carried over from 2014. Vulnerable services include bare steel, early clear plastic, copper, and any ductile iron services.

**Table F.14: 2015 Major Neighborhood Replacement Projects**

Shop	Neighborhood	Total Main Retirement (ft)	Total Number of Services	Vulnerable Services
<b>North</b>				
	Portage Park (7 phases)	178,464	6,388	1,690
<b>Central</b>				
	South Austin (14 phases)	168,725	3,647	
	Brighton Park	121,440	3,988	
<b>South</b>				
	Beverly	169,597	3,821	316
<b>Total</b>		<b>638,226</b>	<b>17,844</b>	<b>2,006</b>

The August 2014 run of the Main Ranking Index model identifies only about one mile (slightly less than 5,000 feet) of main segments having a score of 6 or more. The characteristics of these 12 (all cast iron) segments are:

- Lengths between 2 and 763 feet
- Both medium and low pressure
- Installation dates between 1902 and 1956
- 6" (11 segments) and 12" (1 segment) diameters.

These results illustrate that small diameter (6") cast iron now dominates pipe ranked as highest risk.

Both neighborhood and Main Ranking Index-driven 2014 work correspond to the results of the modeling that Peoples Gas uses to prioritize work. Planned 2015 work will eliminate the mains that reflect highest risk as scored by Peoples Gas. The low amount of highest-ranked main under the Main Ranking Index, however, indicates that it is timely to evaluate whether more immediate-term, index-driven work would produce greater risk reduction in a cost-effective manner. This improvement could occur by lowering the Index score that qualifies segments for immediate replacement, even where they do not lie in top-ranked neighborhoods.

Cases have occurred in which Peoples Gas has altered work schedules driven by the neighborhood and Main Index Ranking prioritizations. The Company checks its plans and schedules against planned work by the City of Chicago and by others. Other underground utility infrastructure improvements and repaving plans can make those changes appropriate, or even required. For the upcoming year's work, Peoples Gas sought to complete the design and engineering work required to have construction contracts in December or early January.

This work proceeds with knowledge of existing plans, but changes, particularly by the City, require continuing attention to schedule. In 2014, schedules for some of the North Shop area's Portage Park replacement work moved forward from 2015. Those not affected by changes in City plans moved back to 2015.

On occasions where City infrastructure work is being performed in a lower-risk neighborhood, moving the priority up on a neighborhood basis may prove particularly problematic. Changing pressure may require some additional infrastructure work by Peoples Gas, such as running medium-pressure feeder lines, supply sources, and detailed engineering analysis. These situations undergo evaluation on a case-by-case basis.

Changes to adapt to schedules for City improvements sometimes take a partial form. For example, where planned City work precedes the schedule for main replacement by a short time, the Company may perform installations at street crossings contemporaneously with City work, but save the balance of the work for later. This partial-replacement work avoids the need for later disruption, because intersections require open-trench construction. Irrespective of whether the City shares in paving and restoration, Peoples Gas saves money (as well as minimizing the public inconvenience during street openings) by coordinating work with the City. When Peoples Gas works in streets recently improved by the City (a so-called "moratorium street"), it must re-open the street, and then re-pave the entire area. (The City requires curb-to-curb repaving.)

**F.9 Peoples Gas does not have a reliable method for identifying the operating and maintenance costs associated with AMRP, pressure increase, or meter relocation work. (Conclusion F.6)**

Peoples Gas has confirmed that it does not have current data or analysis addressing operations and maintenance cost changes as a function of investment in work covered by the Qualifying Infrastructure Plant Surcharge. Peoples Gas has agreed to the development of a cost model that will incorporate this capability.

## **4. Recommendations**

**F.1 Peoples Gas should develop, staff, and implement a data quality control program. (Conclusion F.3)**

The Company should develop and implement a data quality control program, in order to verify that its risk-prioritization models and processes continue to provide accurate results. The AMRP has produced a significant body of work under both models currently used. The data should support sampling of the documentary foundations for segments and neighborhoods completed in order to determine what kinds of information were missing, and what errors available data may have contained. Particularly for work driven by application of the Main Ranking Index, the Company should validate that assumptions and allowances made for missing or erroneous data. The validation should test the sufficiency of conservatism used to give confidence that the Index continues to identify what truly represent the highest-risk segments appropriate for immediate replacement.

Peoples Gas needs to develop a structured program for sharing experiences and problem solutions among the three Shops, as Chapter Q: Field Work Performance reports. Addressing issues of data accuracy should comprise one of a broad range of subjects for such sharing.

Peoples Gas needs to develop a single database combining all leak data. The Company should ensure that all data in various forms, such as PHMSA reports and monthly leak discovery and repaired data, is checked for accuracy and that totals are corrected for errors. Large differences exist between data that Peoples Gas provided to Liberty in several different data requests. The differences show that when leak data is checked against other lists, there are significant variations that cannot be explained by re-grades or timing issues.

**F.2 Peoples Gas should develop a database of soils data already collected, and populate it further with soils data taken at new excavations. (Conclusions F.4)**

The development of a soil database should serve, when reasonably populated, as a factor in determining replacement priorities, particularly for highest-priority segments identified through the Main Ranking Index. When data population reaches a level supporting defensible correlations between soil conditions and risk, Peoples Gas should determine whether and how to turn the data into a quantifiable ranking factor, or alternatively, how to apply it judgmentally in driving replacement priorities.

**F.3 Peoples Gas should conduct a structured study of alternative criteria and weightings for the Main Ranking Index and for the neighborhood approach. (Conclusions F.5 and F.6)**

It is time for Peoples Gas to engage in a structured, comprehensive, and analytically-driven review of other weighting, parameters, and additional inputs to its Main Ranking Index and its neighborhood rankings. For example, the repair rates for pre- and post-1920 cast iron are equalizing. Eliminating that distinction and giving greater emphasis to small-diameter cast iron mains may prove warranted. The Company also needs to address the bias that its zonal approach creates in favor of larger neighborhoods. Normalizing the lengths of small-diameter cast iron may prove beneficial. Another element of the review should be to consider leak history, as opposed to open leaks alone.

**F.4 Should Peoples Gas not change the current criteria and weightings, the Company should develop additional measures to reduce leak rates further. (Conclusions F.5 and F.6)**

Clearly, leaks have not decreased at rates one should expect this far into an accelerated main replacement program. Liberty's review of Type 1 and 2 leaks found that the opposite has occurred. Leak rates at Peoples Gas have increased. Data from 2009 through the third quarter of 2014 show leaks increasing by over 10 percent (from slightly under 3,000 per year to around 3,400). Peoples Gas offered adjustments to account for third-party damage leaks and to normalize for colder winter weather. Even after accounting for them, the rate of decline for the most recent years of the AMRP, 2012 through 2014, remains only nominal. Reports to federal authorities on repaired and pending repair leaks show a much larger increase (1,800 to 2,400) in the decade ending in 2013. Peoples Gas may attribute some of the difference to Type 2 leaks (considered to be potentially hazardous and thus requiring eventual repair) being downgraded to Type 3 (which never need to be repaired because they are not considered hazardous). However, such downgraded leaks are not sufficient in number to account for the difference.

Liberty expected the amount of main-replacement activity in recent years to show a correlation with decreasing numbers of Type 1 and Type 2 leaks. That correlation is not evident. The lack of correlation raises questions like: (a) whether the "right" mains are being replaced, (b) whether the leak rates for remaining mains have grown dramatically, or (c) whether the last, severe winter triggered large numbers of additional failures. Peoples Gas needs to examine these events to determine the causes of the anomalous leak/replacement relationship. Another factor that Peoples Gas needs to consider is the number of third-party damages each year and how infrastructure replacements of all underground utilities affect that rate.

**F.5 Peoples Gas should determine on system, segment, and neighborhood bases the level of acceptable risk and metrics that will support appropriate adjustments in replacement rates. (Conclusion F.7)**

Peoples Gas needs to develop a set of forward-looking metrics that will predict changes in risk level with replacement. Doing so will allow it to adjust replacement rates to meet future increases and decreases in the risk level. Peoples Gas should determine an acceptable risk level for each segment and neighborhood, and use that level to design a plan and schedule of main replacements to reach it.



Peoples Gas has not determined an acceptable level of risk for the general public, its customers and individuals working on the gas system. This tolerable level of risk needs to be determined so that both main-replacement risk models can be operated to reach the desired level. The acceptable level will not be static, but will change year to year, based on the mains already replaced, the activity of the prior year, and the continuing aging of mains not yet replaced.

We have discussed with Peoples Gas the identification of metrics that would relate costs incurred and replacements made to risk mitigation produced. Such metrics would provide benchmarks for assessing the amount of risk reduction achieved for the money spent. Liberty will continue to work with Peoples Gas to determine how to construct such a metric in a fashion that available data can support meaningfully.

Using average numbers of leaks and average main replacement rates (or average numbers of leaks over several years and main replacements over prior years) presents a possibility of developing an appropriate metric to measure risk reduction. Defining such a metric would need to take into account the fact that unusually cold weather can cause leak-rate spikes that can produce anomalous results. Using leak rates averaged over a number of years can help address this impact. Averaging replacement rates over multiple years may also help to correct for lags in physical completion and accounting recognition of retirements. Liberty anticipates that the search for applicable metrics will require an exploratory process, accompanied by deeper review of data issues. Thus identifying whether such metrics exist, and defining them properly if they do, will require an iterative approach.

#### **F.6 Peoples Gas should develop a cost model that addresses O&M costs associated with AMRP and related work. (*Conclusion F.7*)**

This model needs to permit detailed forecasting, estimating, and analysis of operations and maintenance cost changes occurring as a function of investments made to replace main under the Main Ranking Index, and of investments made to serve the purposes of the neighborhood approach.

## *Chapter G Table of Contents*

Chapter G: Cost Planning .....	G-1
1. Background .....	G-1
2. Findings.....	G-1
a. The Cost Plan .....	G-2
b. Maintenance of the Cost Plan .....	G-4
3. Conclusions.....	G-6
4. Recommendations.....	G-7

## Chapter G: Cost Planning

### 1. Background

This report chapter:

- Discusses the nature of cost planning for the overall duration of the AMRP
- Addresses the sufficiency of the overall AMRP cost estimate
- Evaluates the use of contingency or reserve to address the uncertainties that the AMRP presents long term
- Assesses the quality of management's grasp on the drivers of long-term AMRP costs.

A program such as the AMRP requires a comprehensive approach to planning and managing costs. Its duration calls for a long-term cost plan, which this chapter addresses. Other chapters (K: Cost Estimating and L: Cost Management) address cost estimating and the management of costs in accord with the long-term cost plan and with shorter-term project cost estimates.

In 2009, Peoples Gas presented testimony before the Illinois Commerce Commission in support of its request to accelerate replacement of cast and ductile iron pipe. The Company also sought to upgrade low-pressure systems (normal operating pressure of about 0.25 psig) with a medium pressure system (normal operating pressure of about 23 psig). The Company estimated that accomplishing these two objectives would involve completion of the units of physical work summarized in the following table.

**Table G.1: Proposed Main Replacement and Pressure Increase Quantities**

Major Commodity	Quantities	Measure
Neighborhood	196	Each
Interstation High Pressure	63	Miles
Mains	3,056	Miles
Retirement	2,028	Miles
Services	296,391	Each
Meters	406,927	Each
Pressure Regulator Stations - Abandoned	325	Each
Pressure Regulator Stations - New	51	Each
City Gate Station Additions	2	Each

Both the 2009 "Original" and the 2012 "Current" AMRP cost projections use these units of installed (as opposed to retired) quantities.

### 2. Findings

The AMRP should be managed in a manner consistent with the requirements of a multi-billion dollar "mega-project." Peoples Gas should have a forecasting capability that supports continuing projections of final AMRP costs with a high degree of confidence, addressing the material levels of uncertainty necessarily associated with such a program.

## a. The Cost Plan

### i. Total AMRP Cost Estimate Background

Peoples Gas prepared the AMRP's Original Estimate of \$2.63 billion to support the cost recovery mechanism (Infrastructure Cost Recovery) proposed in the Company's 2009 rate case. This early 2009 estimate used 2008 information, and presented costs in 2010 dollars. The current estimate, prepared in early 2013, used information available in 2012, and presented costs in 2012 dollars. This estimate revised total AMRP total cost significantly upward, to \$4.45 billion. This revision came in the context of the latest update in Illinois Commerce Commission Docket No. 14-0496. This estimate used actual costs for the first two years of AMRP work, a current estimate of 2013 costs, the budget for 2014, and a projection of costs for the program's remaining 16 years. This chapter reconciles the original and this current estimate below.

### ii. Assessment of Total Cost Estimate Methods

Preparing a total cost estimate for a project of the size of AMRP comprises a major endeavor. Significant effort and thought went into developing the Original Estimate, which considered the collective experiences and relevant information available at the time. The next table summarizes Liberty's observations about its methods.

**Table G.2: Original Estimate Methods**

<b>Cost Driver</b>	<b>Liberty Observations</b>
Underlying assumptions	Comprehensive – appropriate for the time
Estimating techniques	Sound – in line with industry practices
Scope definitions	Adequate – scope of mains defined by size
Quantities assumed	Reasonable – calculated and weighted based on known configuration and data
Final costs basis	Flawed – expressed in 2012 dollars, with no escalation considered
Engineering costs	Low – at 5 percent of construction costs
Material costs	Fair – based on research of actual and available vendor information
Meter installation rates	Probably low – used data from different environments
Labor rates for internal resources	Fair – based on actual costs
Contractor unit costs	Probably low – based on bid analysis
Annual production	Reasonable – retiring 100 miles per year is achievable
Schedule assumptions	Limited – assuming 20 year duration
Resource ramp-up	Inconsistent with estimate assumption of ramping up for five years and ramping down the last two years – Only one year ramp up and no ramp down
Demobilization	Not considered – an area of cost exposure
Major cost risks	Not considered – changes in regulations, technologies present cost exposure
Major schedule risks	Not considered – 20 years believed long enough to make up for schedule slippages
Contingency	None – failure to account for cost exposures within the known scope
Cost target	No industry data available for reference

### iii. Company Reconciliation of Original and Current Estimates

A first 2012 cost estimate produced a cost of \$4.86 billion, which management followed shortly with a downward revision to \$4.56 billion. Following the availability of more actual (versus estimated) costs, a further reduction occurred, producing 2012's official Total Cost Estimate of \$4.45 billion. The next table shows the Company's reconciliation of the cost estimate growth from

the estimate proposed in the 2009 rate case and the 2012 estimate. This 2012 estimate was the last one issued to address program-length costs, making it the most recent announced estimate.

**Table G.3: Reconciliation of 2009 and Current (2012) AMRP Estimates**

Description	All Costs in \$ million			Remarks
	Original Estimate	Current Estimate	Change	
Intra-Station High Pressure	354	359	5	
Mains	1,343	2,097	754	Installation method changes from horizontal directional drilling to trenchless technologies, also new city regulations
Services	519	1,013	494	Based on actual bidding rates
Meters	151	277	126	Based on actual installation rates
Pressure Regulator Station - Abandoned	9	13	4	
Pressure Regulator Station - New	7	9	2	
House Regulator	76	-	(76)	
City Gate Station	8	10	2	
<b>Total Construction Costs</b>	<b>2,467</b>	<b>3,778</b>	<b>1,311</b>	
Program Management	160	673	513	Design, project Management, contractor inspection services, line locating costs
<b>Total AMRP Costs</b>	<b>2,627</b>	<b>4,451</b>	<b>1,824</b>	

Several observations arise with respect to this cost growth of 69 percent, just two years into the AMRP.

First, program management costs increased by three times, due to changes in assumptions and management strategy shifts. The original estimate, while unrealistically low, reflected only incremental AMRP costs. It did not include several elements initially thought to be covered in-house. Second, the bulk of construction costs lie within the main replacement and the services and meter installation categories. These areas experienced a collective cost increase of almost 68 percent in two years, much of which included revising the primary installation method from direct bore to open cut. Optimizing performance requires close monitoring and management of construction performance, using estimated unit rates as a measurement basis. The next table shows the very large changes in unit rates that one can determine from the two estimates. There has yet been no stable, accurate basis for measuring AMRP performance. The unit rate changes shown in the next table demonstrate the instability. A failure to monitor and manage unit rates carefully tends to cause construction performance to drift unfavorably.

**Table G.4: Unit Rate Changes from Original to Current Estimate**

Unit Cost of Commodity	Unit of Measure	Original Estimate	Current Estimate	Change	Percent Increase
Intra-Station High Pressure	\$/station	5,607,748	5,558,432	(49,316)	-1%
Mains	\$/mile	439,511	691,431	251,920	57%
Services	\$/service	1,750	3,365	1,615	92%
Meters	\$/meter	559	728	169	30%
Pressure Regulator Station - Abandoned	\$/station	28,795	40,246	11,451	40%
Pressure Regulator Station - New	\$/station	143,975	177,782	33,807	23%
City Gate Station	\$/station	3,947,839	4,895,630	947,791	24%

*iv. Program Contingency*

Liberty found it surprising that the revised, 2012 estimate contained no contingency. A program cost growth of 69 percent in two years indicates that project cost and schedule risks have not been carefully addressed. That rate of growth should also signal to management that uncertainties in a major program of this magnitude and duration require recognition and treatment in the long-term cost plan. Even without the warning signals presented by the first two years of experience, a program of the AMRP's size, complexity, and duration calls for a clear and direct treatment of contingency.

The term "contingency" has different connotations to different people in the industry. A general perception is that it is meant to provide reserve for use whenever extra funds prove needed. Further, some operate with the view that explicitly recognizing the potential need for added funds makes them inevitable and implicitly acceptable. This view causes some to avoid the use of contingencies in estimating. The best practice view, however, recognizes that good estimating requires the use of contingency, for both small and large projects and programs. Determining the proper amount requires careful judgment, but ignoring contingency does not offer a sound alternative.

Peoples Gas does not use contingency in its long-term program cost plan (*i.e.*, across the full AMRP 20-year duration). The Company, however, does include contingency in its annual budgets. The primary use of contingency in these budgets is to address growth in contractor costs. Annual budgets use two categories of contingency: allocated and unallocated. Allocated contingency includes the costs required to manage known events or issues. Allocated contingency includes requests (Field Order Authorizations and Change Orders) in progress but not yet approved. Allocated contingency also includes the effects of emerging trends that management can attribute to a specific cost account or project. An example of such a trend might be a change in City of Chicago Department of Transportation requirements. Unallocated contingency consists of the cost required to manage unknown events or issues. The program manages unallocated contingency through a line item in the budget. Management transfers unallocated contingency amounts to more specific accounts as circumstances dictate. The AMRP Senior Project Manager must approve any transfers from the unallocated contingency account.

**b. Maintenance of the Cost Plan**

AMRP management established the current Cost Plan by laying out the annual gas main quantities it needed to replace. Design analyses supported this planning foundation. The gas main quantity

required to be replaced amounted to about 2,000 miles. Management identified the other categories of work involved (such as new gas main installation, services, meters, pressure regulator stations, and city gate stations), and established estimated quantities for those categories. Material cost calculations used available vendor information. Estimates of labor costs to move and install meters used historical data. Management approached the estimation of installation costs for gas mains and services by analyzing information from reasonably current bids. Support group costs (*e.g.*, design engineering and construction inspection) also required estimation and monitoring.

At a minimum, quantity, unit cost, and productivity require close monitoring and control. Peoples Gas, however, has only tracked the annual installation quantities of gas mains, services, and meters. The Monthly Status Report provides this tracking. Four years into the AMRP, one can find little focus on how the program has performed with respect to the original estimate assumptions, apart from current year production. The current AMRP cost management philosophy focuses on spending the annual budget and doing the best it can to reach 100 miles of main replacement. The failure carefully to track and focus on construction performance and project cost trends undermines attention on and eventually the capability for producing a credible estimate of final, total AMRP costs. Liberty also found no plan or set of structured processes defined and documented to monitor projected total program costs.

The Project Management Office (“PMO”) displayed particular sensitivity to addressing the potential impacts of future uncertainties. Liberty acknowledges that a long-term, complex, multi-billion project spanning 20 years makes a deterministic, or single-point estimate of final costs unhelpful in managing the AMRP. That difficulty, however, does not justify avoiding treatment of such uncertainties. The AMRP requires a number of cost planning elements that it does not yet possess. These elements include a long-term estimate, the ability and commitment to track against it continually, and processes for assessing and trending scope additions and subtractions. Peoples Gas acknowledged during Liberty’s field work the need for developing new tools essential for bringing these elements into existence.

Liberty learned from field work during mid-2014 that management had underway an update of the total program cost estimate. The Company led Liberty to believe that it would produce reviewable results imminently. Management agreed to provide a presentation of the new cost estimate on a preliminary basis. Canceled at the last minute, the presentation never happened, and AMRP management informed Liberty that Peoples Gas had abandoned efforts to produce a new estimate in the near term.

Instead, management hired a Planning & Forecast Manager, who has strong construction background. Management tasked this individual with developing an entirely new cost model, after taking a broad view of AMRP direction and consideration of the risks the program faces. That new model was to form the basis for a new total cost estimate. The Company has also advised that new modeling capability will incorporate the ability to address changes in operating and maintenance costs associated with capital investments in replacing high-risk pipe, moving meters to outside locations, and increasing pressures from low to medium levels.

Management estimated that it would take six months to complete work on a new cost model for use in generating a new estimate of total AMRP costs. Current initiatives continue to address these

objectives. Three months after the end of management's six-month time estimate, however, the AMRP continues to lack an announced new cost plan and a current estimate of total program costs at completion. Liberty has no reliable information on when Peoples Gas plans to issue a new estimate.

### 3. Conclusions

**G.1 The AMRP does not have a long-term cost plan that provides a credible estimate of final program costs; management is only now creating the modeling capability to produce such an estimate. (*Recommendation G.1*)**

The original (2009) Cost Plan contained sufficient detail, and used appropriate assumptions to establish production quantities and unit costs. The 2012 estimate updated total program costs, but its \$4.45 billion estimate used 2012 dollars. The use of 2012 dollars significantly understates expected final costs. The AMRP needs a new cost plan that will provide a current final cost estimate. An effort to provide such an estimate collapsed in mid-2014.

We found, as Peoples Gas has acknowledged, that it could not provide a meaningful total estimate of AMRP costs without first developing new cost modeling capability. Sound estimates comprise a critical element in effective management of AMRP costs. Peoples Gas has embarked on efforts to develop that model. It needs to complete model development, and estimate work expeditiously. Moreover, the results of the modeling effort need to address more than the direct costs of AMRP work. Peoples Gas also needs to develop the modeling capability to address the ongoing O&M costs and savings over the long term. The Planning and Forecasting Manager has responsibility for cost model development.

**G.2 AMRP estimates break program costs down into suitable major categories by year, but management does not use that breakdown to inform cost tracking at either the program-wide or project-specific levels. (*Recommendation G.1*)**

Managers cannot manage what they do not monitor, and cannot monitor what they do not measure. Cost tracking needs to provide information at a significantly enhanced level of detail.

**G.3 The AMRP program's lack of reserve to cover cost growth fails to reflect potential cost exposure. (*Recommendation G.1 and G.2*)**

Best cost estimating practice regards contingency or reserve as a necessary part of a total cost estimate. Cost estimates need to recognize uncertainties that make full cost driver definition imprecise. A specific portion of funding should be earmarked to account for unforeseeable elements of cost. Hence, owners often add contingency or reserve to an estimate to provide for uncertainties in defined scope and in internal and external cost drivers.

A traditionally derived contingency amount will likely prove inadequate in forecasting the costs of a major, long-term program. Liberty therefore favors the term "reserve" or "management reserve" to account for the many uncertainties that exist within and outside program scope as currently defined. Scope changes will almost inevitably occur, and likely have substantial impacts. This broader definition allows a more robust portrayal of forecasted final costs.



**G.4 Management does not compare AMRP costs and performance with what others in the industry have experienced. (Recommendation G.1)**

Major main replacement work has become more common in the industry. It is useful to examine the performance of others, in order to provide a benchmark for gauging one's own approaches, methods, practices, and results. The AMRP appears to use no organized or documented approach to meeting this need. Instead, project management simply cites the experience of Jacobs Engineering, which leads and staffs most of the Project Management Office, as providing insight into other companies' efforts, making such comparisons unnecessary in its view.

In the development of the revised Total Cost Estimate, Peoples Gas did make use of some industry data; *i.e.*, a conversion factor published by the Handy Whitman Construction Trend of Utility Construction – North Central Region to price out most of the major commodities. The next table summarizes that information.

**Table G.5: Handy Whitman Index Data**

<b>Handy-Whitman Cost Index</b>	<b>2010, Jan 1</b>	<b>2012, Jul 1</b>	<b>Factor</b>
Mains, Steel	656	826	1.2591
Mains, PE (polyethylene)	482	521	1.0809
Services, PE	501	536	1.0699
Meter, Materials	257	271	1.0545
Meter, Installation	708	923	1.3037
Regulator Materials	406	438	1.0788
Regulator Installation	692	889	1.2847
Regulator Stations	567	700	1.2346
City Gate Stations	568	704	1.2394

**G.5 Peoples Gas does not sufficiently understand and quantify major cost drivers. (Recommendation G.1)**

A cost driver is an activity or component that adds significant cost to a project or program. Periodic cost analysis of actual data can yield relationships or linkages between events and contributions to cost increases. Examples of such contributors include contractor change orders, restoration contractor costs, material pricing, changes in City requirements, labor costs, and escalation. Cost professionals in the cost management organization should perform such analyses.

## **4. Recommendations**

**G.1 Peoples Gas should develop a new Cost Plan Model that includes comprehensive measurement bases and critical assumptions regarding scope, quantities, productivity, labor costs, unit costs, and regulatory requirements; a reserve should be included as part of the overall program costs. (Conclusions G.1, G.2, G.3, G.4, and G.5)**

A first deliverable of this Model will be the new Total Cost Estimate. For Peoples Gas to be able to project final AMRP costs on a continuous basis, it has to establish a new capability to estimate on an almost real-time basis the total program costs. Liberty understands that a new AMRP cost

forecasting model will be developed by the Planning and Forecasting Manager. Features important to consider in development of that model include a number of elements that will assist in making the cost plan a sound, comprehensive baseline for continually measuring performance.

Key parameters to measure at the program level include:

- Cost Metrics (input related)
  - Program-to-date costs by year expended
  - Potential cost impacts from Cost Trend Program
- Production Metrics (output related)
  - Program-to-date miles of main installed
  - Program-to-date miles of main retired
  - Program-to-date services installed
  - Program-to-date meters moved/installed
  - Program-to-date pressure regulator stations installed
- Productivity Metrics (output versus input)
  - Average cost per mile installed
  - Average cost per mile retired
  - Average cost per service installed
  - Average cost per meter moved
  - Average cost per pressure regulator station installed.

A comprehensive cost plan should incorporate the following elements:

- Effective cost control tools
- Specifically defined tools for each key element of the AMRP project costs
- Ability to promptly identify and respond to cost issues during the course of each project, facilitating corrective action and providing meaningful and timely forecasts
- Agreement among the team on the structure and viability of the tools and resulting reports
- Understanding by the managers regarding the tools and commitment to their use
- Ability to document that AMRP project costs were prudently managed during the life of the program.

Such a plan should take the following approach:

- Senior Management communicates cost management expectations
- Responsible manager assists in developing the cost element plan
- The cost element plan is evaluated
- Performance is measured by compliance with the cost management plan.

The plan should seek to establish:

- Accountabilities for specific cost elements
- Tools to be utilized, including how and when
- The tasks required of the manager, cost analysts, and others
- Data and reports, including when prepared and to whom distributed
- Analytical expectations
- Corrective action responsibilities.

Other guidelines for developing the cost plan include:

- The plan should identify tasks that represent a disproportionate cost risk or otherwise require special treatment (this identification should include tasks that have a relatively high work-hour budget)
- An assigned cost analyst should prepare the cost element plan with input received from all involved managers
- The cost element plan should undergo review and approval by AMRP project manager before its inception
- The cost element structure should be simple, and consist of one to two pages.

Important features of the cost element structure include:

- Breaking the AMRP down into specifically identified cost elements
- Structuring the elements in accordance with their control characteristics
- Elements that might include engineering, planning and support functions, materials, mains, services, meters and regulators, other construction items, such as intra-stations, city gate stations, and pressure regulator stations, for example
- A total population of 8-12 elements, of various size and importance
- Element features that define the following:
  - A cost estimate, including its basis and assumptions
  - The manager responsible for the costs associated with the element
  - A cost engineer or cost analyst assigned to track and analyze its associated costs
  - Its control category based on its controllability and the sophistication of control demanded:
    - A = High importance – maximum control activities
    - B = Either less important or less controllable, but still significant and some degree of special attention is appropriate
    - C = Inconsequential – hence ignore.

The plan should also include a Cost Element Database having the following characteristics:

- The cost element database serves as the repository for all of cost element information
- The database structure supports collection of cost estimates and documentation of changes to them
- The sum of the cost elements at any point in time produces the “defined cost.”

Each element falling into Category A or B elements (as described immediately above) requires a cost management plan with the following characteristics:

- The plan can be anywhere from one to a few pages, and may include supporting attachments.
- It defines the specific actions that will be taken to manage costs.
- It is both a tutorial and a procedure.
- It is likely to include key metrics and specifically what is to be done with them, required reports by contractors and others, a requirement for monthly analysis by the cost engineer, specific actions required of the manager, and update requirements for the model.
- Plans should be maintained and updated in a cost management manual.

One suggested approach for the AMRP would develop Individual Cost Management Plans to focus on the major cost elements:

- Main Installation
- Service Installation
- Meter Installation
- Other Construction Items
- Engineering
- All Other Support Groups
- Materials.

These major cost elements focus on cost issues common to all projects or phases of a project, producing a template like that shown in the next illustration.

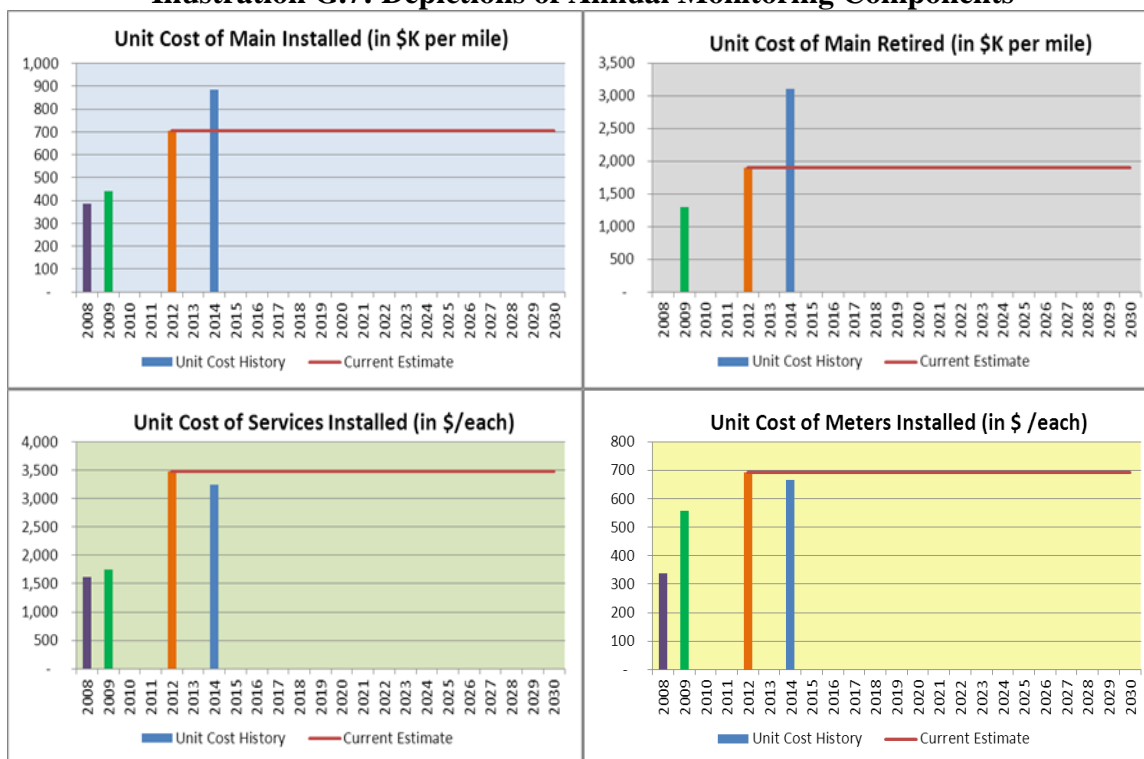
**Illustration G.6: Cost Element Template Example**

	Main Installation	Service Installation	Meter Installation	Other Construction Items	Engineering	All Other Support Groups	Materials
	Category A	Category A	Category A	Category B	Category B	Category B	Category B
Project A							
Project B							
Project C							
Project D							
Project N							

Management should prepare and continuously maintain a detailed cost management plan for each element.

Monitoring proves essential to making a cost plan function optimally. Given the AMRP's long duration, management should monitor annually the following areas: unit cost of main installed, unit cost of main retired, unit cost of services installed, and unit cost of meters installed. The following charts show examples of monitoring depictions.

**Illustration G.7: Depictions of Annual Monitoring Components**



Explanations of the source of data on the preceding charts include:

- 2008 – Historical data up to that year
- 2009 – Original AMRP Total Cost Estimate (\$2.63 billion)
- 2012 – Current AMRP Total Cost Estimate (\$4.45 billion)
- 2014 – Actual based on completed projects.

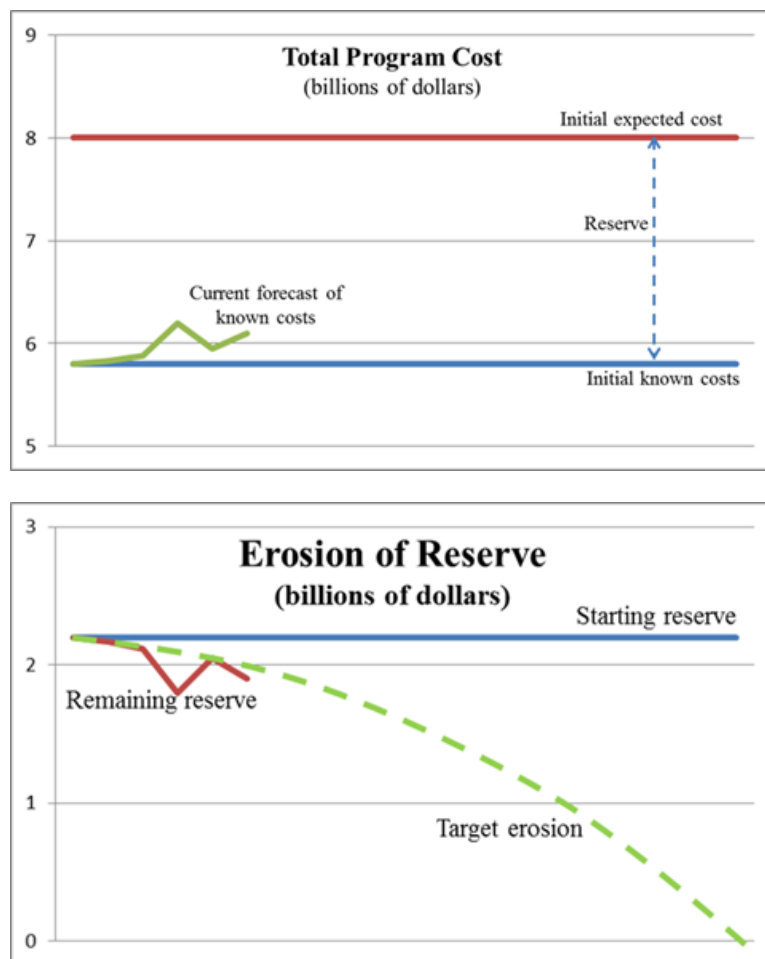
Note that unit costs in the 2012 Current Total Cost Estimate would provide the monitoring base until management completes a new Total Cost Estimate.

Other important elements in tracking total AMRP costs should include:

- The defined and expected costs become the standards for tracking program costs
- As the defined costs change, the amount of reserve remaining erodes, and the pace of such erosions becomes a key metric
- Expected costs may undergo periodic revision if and as the pace of erosion becomes too fast or too slow
- The key metrics can be displayed over the full 20 year period, but a shorter window can be selected to supplement the long-range view as warranted.

The next charts show simplified, hypothetical means for depicting erosion in the cost plan.

**Illustration G.8: Depicting the Erosion of Program Reserve**



Two important aspects should apply with respect to model updates:

- The model produces real-time cost forecasts; *i.e.*, changes in the defined program costs as they are revealed
- The assigned cost analysts or cost engineers initiate model changes, based on reconciled cost trends and monthly analysis of cost elements.

After completing the current work to establish a new final AMRP cost estimate, Peoples Gas needs to develop an effective cost forecasting capability, in concert with the cost management program.

## **G.2 Peoples Gas should establish a Cost Trend Program to monitor potential, major cost-affecting items. (Conclusion G.3)**

Such a cost trend program serves as an early-warning system for potential cost deviations. Potential cost changes should get reported immediately, by an assigned cost analyst or cost engineer. Interventions can be initiated to mitigate correctible problems or minimize cost impacts. The cost trend program is a valuable tool that provides up-to-date information that enables Peoples Gas to forecast the final AMRP costs on an almost real-time basis.

## *Chapter H Table of Contents*

Chapter H: Schedule Planning .....	H-1
1. Background .....	H-1
2. Findings.....	H-1
a. Master Schedule Plan.....	H-2
b. The Scheduling Function .....	H-4
c. Production Targets in Schedules.....	H-8
d. Resource-Loaded Schedules .....	H-9
e. Schedule Changes and Updates .....	H-10
3. Conclusions.....	H-11
4. Recommendations.....	H-13

## Chapter H: Schedule Planning

### 1. Background

This report chapter:

- Assesses long-term schedule planning and the schedules that drive replacement work in the immediate term
- Discusses the organization and resources that perform and support the scheduling function
- Examines the tools and processes that support scheduling functions and activities
- Reviews the use of production quantities and personnel resources in scheduling
- Evaluates the means used to monitor schedule performance and update schedules.

Good project scheduling provides real-time visibility on where a program or project is heading in comparison with clear milestones. Scheduling outputs should provide a common platform for the whole project team, focusing attention on important activities on critical paths. Good scheduling will ensure effective and efficient project and program execution.

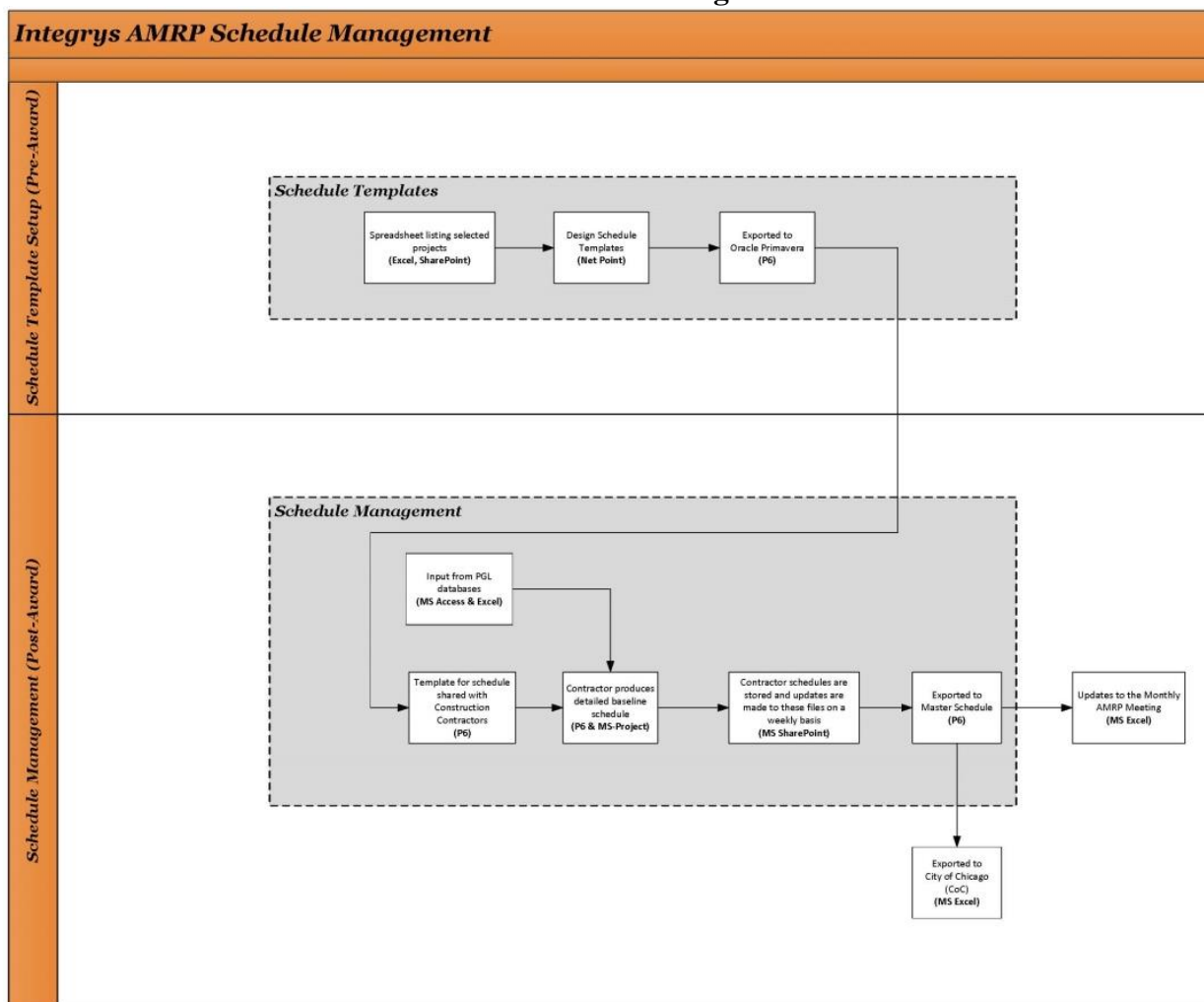
Liberty evaluated the appropriateness and credibility of AMRP schedule planning. The examination addressed the AMRP's overall long-term schedule plan and the more detailed near-term schedules. The latter should form part of and be integrated with that long-term plan. Bulk quantities (feet or miles) of main to be replaced in each schedule time period comprise a paramount driver of program schedules. Overall, the AMRP's main replacement target, both peak and average over the 20 years, should drive overall planning. It defines the level that must be maintained to support the eventual replacement quantities in the field. Integrating engineering and procurement activities, considering the drivers of work planning, ensuring activity coordination, addressing permitting, and aligning contractor and employee resources form important elements in constructing achievable, but appropriately aggressive schedules.

### 2. Findings

Work by PwC, which has consulted for AMRP management for a number of years, has produced a good summary of the program's scheduling management process. The next chart depicts that process.



**Illustration H.1: Schedule Management Process**

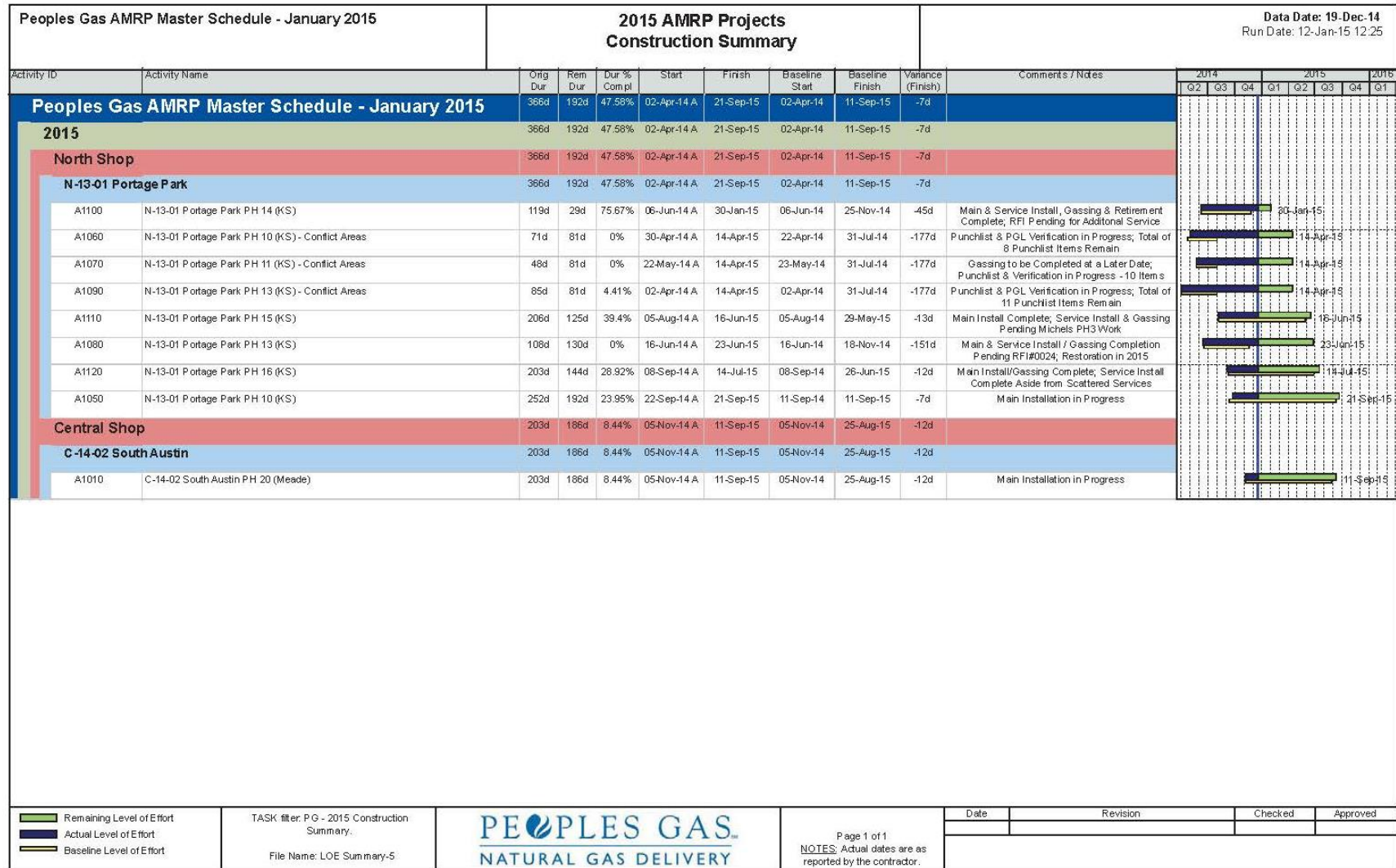


#### a. Master Schedule Plan

No AMRP Master Schedule exists at the long-term, program-wide level. The approach to scheduling has been to use the annual budget to drive the schedule. This approach will support an overall 20-year duration, provided that annual cost limits can support the average target completion rate of 100 miles per year for 20 years. However, the first four years produced an average annual rate of only 70 miles. Liberty found no assessment on the impact of the current progress rate (70 percent of that required to meet 20 years) on total duration. Liberty also found no long-term schedule recovery plan or evidence of focused efforts to identify any. The lack of assessments and recovery planning evidence that annual spending limits prevail in the minds of management over completion within 20 years as the AMRP time driver.

Scheduling for 2015 (see the next table) addresses projects already active plus incomplete projects (or project phases) started in 2011 through 2014. The two active 2015 projects consist of Portage Park and South Austin.

Figure H.2: 2015 Schedule of Active Projects



## **b. The Scheduling Function**

Program management develops an annual schedule with development of the annual budget. To date, program schedules only address construction, excluding, for example, design and permitting. AMRP management uses schedules provided by the contractors performing main and service installations to begin schedule development. Management adds to these contractor schedules required back end work, such as meter installations, performed by the internal Company workforce.

### *i. Construction Scheduling*

The activities involved in assembling the annual construction schedule for input into the scheduling system follow this sequence:

- Engineering generally completes the design of projects or phases of a project by the end of the preceding summer
- Bid invitations issue at the beginning of November
- Contractor bid awards occur at the end of January
- Preliminary meetings with contractors (about 15 days later) discuss construction baseline schedules
- Contractors provide construction schedules for import into the scheduling system (P6) in mid-February
- The three Peoples Gas Shops provide scheduling information for the employee-performed AMRP in March, as the construction season approaches commencement.

### *ii. Contractor Scheduling Process*

Management terms this overall contractor schedule the Construction Project Schedule. Each project passes through three schedule phases, developed for the stages through which each progresses.

Management terms the first schedule that each project uses the Preliminary Project Schedule (“PPS”). Bid packages to which contractors respond define work sequences for each project phase. Contractors must submit a Preliminary Project Schedule (using critical path method scheduling) when providing a price proposal as part of bidding for particular projects.

The Preliminary Project Schedule of the contractor selected covers first project activities, and eventually provides the foundation for the next, or Project Baseline Schedule. The Preliminary Project Schedule provides a preliminary logic plan for the project, divided (for multi-phased projects) at the phase level. Management depicts the Preliminary Project Schedule as a network diagram. The diagramming uses a “Sample Logic Model” provided by the Project Management Office’s Senior Scheduler.

This summary-level diagram depicts a work breakdown structure, at the level required eventually to produce a fully developed baseline schedule. A Preconstruction Conference, scheduled within fifteen calendar days after bid award, uses this basic logic to support a discussion of more detailed requirements, reporting, logic, and expectations.

A project's second schedule, the Project Baseline Schedule, comes from the contractor. It becomes due within fourteen calendar days following the Preconstruction Conference. Contractors submit these fully developed baseline schedules for review and acceptance by the Project Management Office. The Project Baseline Schedule submittal presents the contractor's complete plan for executing work in accordance with bid and contract documents. Contractors work with the three Peoples Gas Shops, in order to allow sufficient time for the Shops to identify their work activities. Submission to the Project Management Office occurs after this coordination between contractors and the Shops. The Project Management Office's Senior Scheduler reviews these schedules, and must accept them.

A project's third schedule stage, the Project Schedule Update, involves weekly contractor reviews and schedule updates that seek to incorporate all current information. The data considered includes progress, identifies approved adjustments of logic and duration, and proposes any changes required.

At the time of Project Baseline Schedule development, contractors produce schedule narratives for each project. These narratives overview each project as a whole. The narratives discuss details of contractor execution plans, the sequencing plans that the Shops provide for their work, contractor crew loadings, the sequencing plan, explanations of lags and constraints applied when scheduling activities, and contract milestones tied to the applicable dates from the Project Baseline Schedule.

Contractors prepare and maintain these three types of Construction Project Schedules. Their contracts define start and completion dates. Contractors must establish progress rates required to meet the finish dates defined in purchase orders. Contractors use these Construction Project Schedules to plan, organize, and execute work. These schedules also provide reference points for recording and reporting performance and physical progress. They show how the contractor plans to complete all remaining work as of each progress report.

Project Baseline Schedules provide the basis against which management monitors and measures project production and progress. These schedules use project scope dimensions, specified milestones, and completion dates from the applicable contract. These schedules use critical path method ("CPM") scheduling. The construction industry very commonly uses this, so-called CPM method and the Precedence Diagramming method.

Critical path method scheduling generally consists of constructing a project model that:

- Lists all work activities required for completion, generally using a work breakdown structure (a breakdown of a project into smaller elements to enhance the detail available for use in cost estimate and schedule development and control)
- Identifies the duration required to complete each of those activities
- Identifies the dependencies that exist between activities, and the activity start and completion dates (or interim milestones) required to accommodate those dependencies
- Identifies logical end-dates and deliverables associated with them.

The Precedence Diagramming Method (also commonly used) employs a box and line diagram that identifies activities (nodes) connected by arrowed lines showing dependencies.

These Project Schedules thus show the sequence and interdependence of activities required for complete performance of the work. They begin with the Contract Start Date, and conclude with the Contract Completion Date. The maximum duration of any physical work activity cannot exceed twenty working days, unless approved by the Project Management Office's Senior Planner.

### *iii. Scheduling Tools*

The AMRP Project Management Office uses the industry-accepted Primavera Advanced P6 tool to maintain project schedules. Liberty engaged in a demonstration with the organization's Senior Planner. This demonstration covered the hierarchy from the master schedule at the top down through detailed level schedules. The demonstration addressed both engineering and construction scheduling.

Management has online access to baseline and updated schedules. The schedules for work in 2013 and 2014 began with construction schedules developed for use in the field. Engineering schedule development came later, and sought to produce the work required to support construction schedule requirements. Program management appears now to be approaching completion of efforts to integrate engineering and construction schedules. The goal was to begin producing integrated schedules for 2015 work. In addition, the AMRP has now reached a point where it can load the Peoples Gas construction work into master schedules as well. Earlier construction schedules included only contractor work.

There has not been a plan, beyond engineering and construction, to develop schedules for other work groups, or to integrate their activities into engineering and construction schedules.

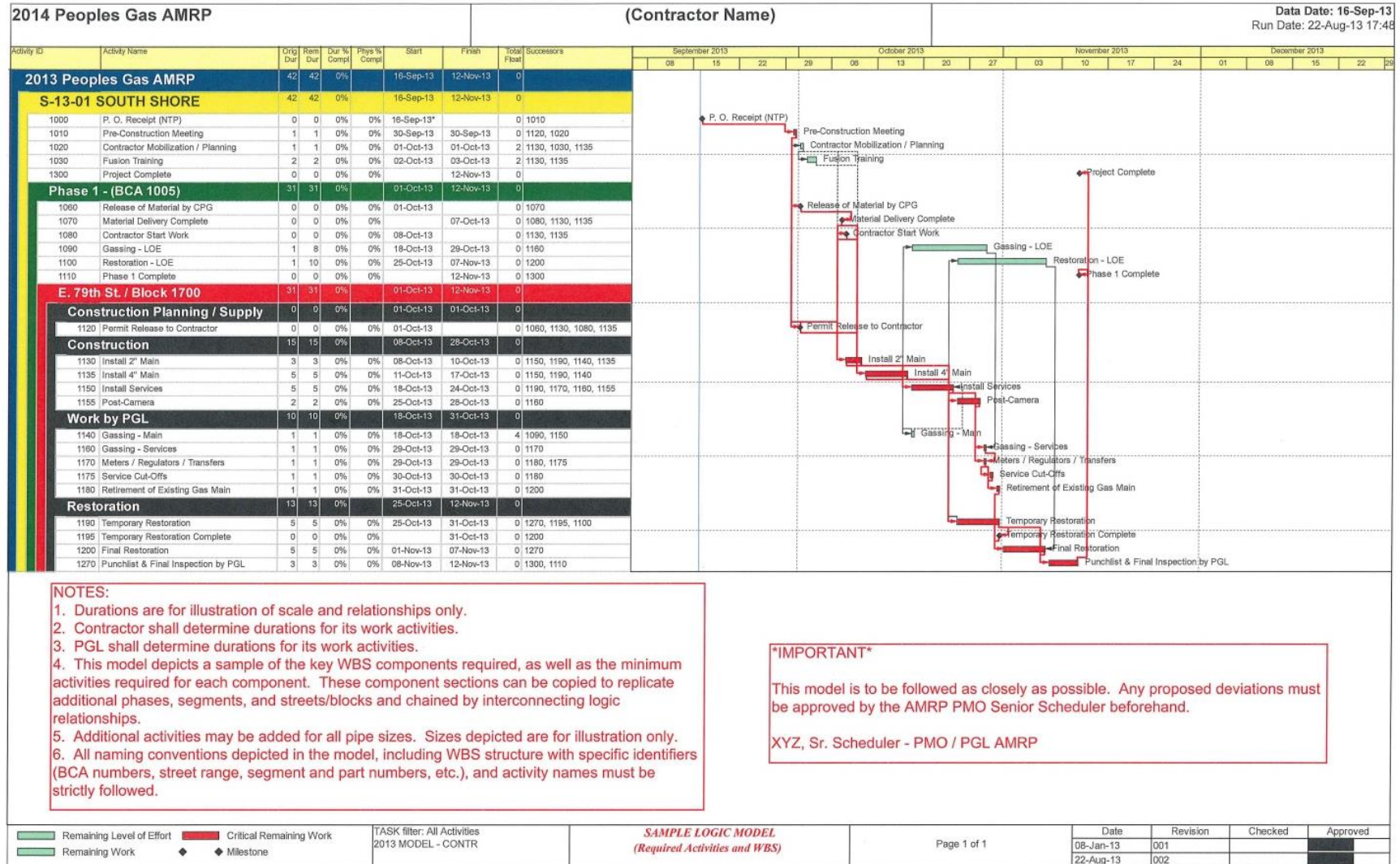
### *iv. Scheduling Logic*

All AMRP contractors must use a "Logic Model" for project schedule creation. The next diagram illustrates the model's required work breakdown structure and correct logic sequence for work activities for a sample project (from 2013). Specialized projects (*e.g.*, high-pressure mains) have unique Logic Models. The Peoples Gas back end work is integrated with contractor construction work. The Logic Model identifies all required activities for each project, phase and street/block number, establishing the level of detail required for each.

The Logic Model depicts a "zero total float critical path." Float identifies the amount by which an activity can be delayed without threatening the project's end date. An activity with zero total float has no float. Thus, any delay in completing it will delay total project completion. The model ensures that contractor baseline schedules will contain a zero total float critical path. Contractors receive an electronic file of the Logic Model (compatible with AMRP management's automated system, Primavera P6), enabling contractors to use it as the basis for building a project schedule in Primavera P6.



Illustration H.3: Sample Logic Model



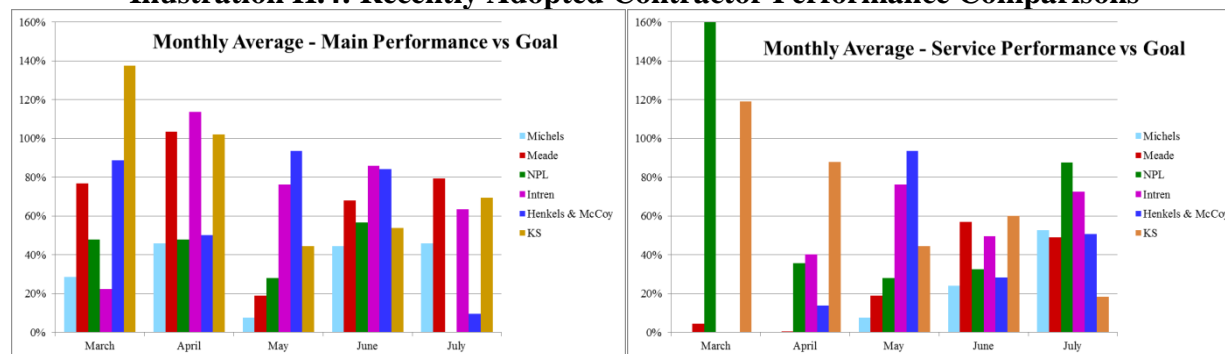
### c. Production Targets in Schedules

To date, the AMRP tied no schedules to quantities of work performed. the industry commonly uses S-curves to depict quantities installed over time. These curves display cumulative quantities, costs, labor hours or other variables plotted against time. The term derives from the fact that curves typically are flatter early, become steeper in the middle, and then turn flatter again at the end of a project. This shape typifies most project courses, which follow a slow but increasing early pace, and experience a decelerating end phase as required work approaches completion.

Peoples Gas agrees with the need to begin to tie schedules with quantities, and has reported an initiative to develop and employ that approach. If completed expeditiously, this initiative should produce significant enhancement in progress and performance monitoring and management. The Company has recently required both their internal workforce and contractors to submit quantity-based schedules. Some contractors reportedly need to deal with logistics and phase-in difficulties in meeting this requirement. Two of the six major contractors have already demonstrated the capability to submit compatible schedules with quantity S-curves. Management expects that all 2015 installation schedules will be quantity-based.

Peoples Gas currently submits its work quantities to contractors. Through an interim, manual process, contractors then submit their and the Peoples Gas quantities to an AMRP analyst for inclusion in Weekly Progress Reports and Monthly Status Reports. Plans are underway to enable the contractors to report installed quantities electronically through the project schedule tools. In July 2014, AMRP planners began to analyze contractor performance against goals. Monthly comparisons addressing the production of each contractor now form part of the Monthly Status Reports. The next charts illustrate the performance comparisons that began in July 2014.

**Illustration H.4: Recently Adopted Contractor Performance Comparisons**



AMRP management also monitors production at the crew level, as the next tables summarize.

**Table H.5: Contractor Crew-Level Production Monitoring**  
**Weekly Main/Crew Average (ft)**

Michels	168
Meade	384
NPL	21
Intren	254
Henkels & McCoy	182
KS	422

**Weekly Services/Crew Average**

Michels	1.5
Meade	2.3
NPL	0.8
Intren	3.7
Henkels & McCoy	1.6
KS	5.6

**d. Resource-Loaded Schedules**

Resource-loaded schedules provide a timeline that details resources allocated to planned activities and preset milestones. Such schedules provide a visual representation of how available project resources align with specific, scheduled activities. These schedules depict the planned use of project resources throughout scheduled project time. This depiction permits continual evaluation of the sufficiency of resources and of their effectiveness in meeting established schedule milestones.

AMRP management did not resource load the construction schedule for the Peoples Gas internal workforce, citing bargaining unit objections. There was also a concern about maintaining the ability to divert resources from AMRP work to perform emergency work. An initiative now underway seeks to incorporate resource loading and crew make-up, in order to enable monitoring of production in the “Meters/Regulators/Transfers” activities of Shop construction schedules.

During the early part of each calendar year (after the bid-winning contractors submit their schedules), AMRP management seeks to allocate the internal resources needed to install and move meters in step with contractor main and service installations. Loading the internal resource at the city-block level requires assumptions about availability and productivity of internal work crews. Collaborative planning sessions with Shop supervisors, using NetPoint, seek to support this resource-leveling process. NetPoint is an industry-accepted tool that supports interactive and collaborative planning and scheduling in a manner that promotes real-time adjustments and visual depictions.

Contractors then receive the resulting activity durations for incorporation into their schedules. Competing demands for internal labor resources, variability in the resources required from block to block, delays in service markings, and delays in obtaining permits from the City, however, exemplify the difficulties that make production estimated by this model challenging to meet. Such issues also made maintenance of the model and the contractor schedules complicated.

AMRP management responded by limiting resource leveling and duration forecasting to the phase level (*i.e.*, abandoning the block-by-block approach) for 2014 AMRP projects. This revised approach bases productivity assumptions on the number of meters that the internal workforce in each Shop can generally produce on a given day. This approach does not consider the particular mix of meters involved or difficulty in obtaining access to work on specific blocks or at specific addresses. This output of this revised process provides contractors with: (a) an estimated overall duration for Peoples Gas Meters/Regulators/Transfers activities, and (b) a forecasted date for completion of retirement activities by project phase.



The Construction Planning Group also uses these models in information exchanges with the City, to provide anticipated dates (by quarter) of retirement and final restoration. Using planned retirement sequences, management applies NetPoint to levelize Peoples Gas resources, and project completion dates for the installation of meters in a given phase. Following levelization, management forecasts retirement and final restoration dates.

AMRP contracts generally use unit-price or lump-sum pricing mechanisms. Contractor schedules have not been resource-loaded. Tracking their crew counts occurs weekly, as the next illustration depicts.

**Table H.6: Weekly Contractor Crew Count Reports**

Shop	Central		North		South		Contractor Total	
	Installation	Restoration	Installation	Restoration	Installation	Restoration	Installation	Restoration
Meade	1		2	1	14	3	17	4
NPL	6	1	3	8	4	6	13	15
H&M		2	1		3	2	4	4
KS	3	5	5	1			8	6
Michels			20	14			20	14
Intren	6	5	2		2	1	10	6
<b>Totals</b>	<b>16</b>	<b>13</b>	<b>33</b>	<b>24</b>	<b>23</b>	<b>12</b>	<b>72</b>	<b>49</b>

#### e. Schedule Changes and Updates

When project changes make schedule delay expected, contractors complete a “Schedule Impact Notice.” These notices identify causes affecting work activities, and include a fragmentary network (fragnet). A fragnet displays a sequence of new activities proposed to be added to the existing schedule (*e.g.* due to a change in scope). A Form of Authorization process can be initiated to secure additional funding to address the work changes involved.

Liberty sought to identify any schedule variance analyses performed by AMRP management on a periodic basis. Peoples Gas observed that the monthly status report explains all schedule variances by project. The following table (extracted from the year-end 2014 report) shows almost 80 percent of projects behind schedule (108 out of 137). Liberty has not found any analyses of these delays. Such analysis would enable identification of common or systemic issues that should be addressed by corrective action plans.

**Table H.7: AMRP Reporting of Contractor Schedule Status**

Contractor	Number of Shops	Number of Active Phases	Average Variance (days)	Number of Phases with Negative Variance (Behind Schedule)
Henkels	2	6	-19	2
Intren	3	17	-54	12
KS	3	18	-94	16
Meade	3	58	-121	50
Michels	2	12	-58	9

Nash	2	6	-76	6
NPL	3	18	-112	13
Total		137	-94	108

### 3. Conclusions

#### **H.1 The AMRP Plan does not include schedules at an overall program level; detailed generic schedules existed at the construction level, but not the production support level. (*Recommendation H.1*)**

The AMRP plan should include, at a minimum, schedules at an overall program level, at a production support level, and at a detailed process level. Management has not prepared or used them.

The AMRP does not have the capability to assess in a credible way whether the program's 20-year duration remains achievable. Nor can management quantify the length of any anticipated delay. The program has used detailed generic schedules addressing construction activities only for the current and the following year. These generic schedules reflected physical work only. They did not address the work activities needed to support construction.

#### **H.2 Individual project schedules initially reflected only contractor work, but now include physical work performed by the internal workforce, and Peoples Gas is integrating engineering schedules into them. (*Recommendation H.2*)**

Schedules should reflect the requirements of each work group required to support overall production targets. That has not been the case historically for the AMRP, which until recently, included schedules only for contractor work.

Project schedules normally begin with the engineering and design phase, and then integrate construction and completion work. The AMRP scheduling function begins in reverse, with the completion of contractor schedules for projects. AMRP scheduling then adds the back end work activities of the Peoples Gas crews. Then, management develops engineering schedules for the projects, based on the construction schedules. Efforts underway now seek to provide for the development of engineering schedules first. The construction schedule can then be developed by adding to the Project Baseline Schedule (provided by the awarded contractor) the associated work activities performed by internal Peoples Gas personnel. This new approach will ensure a natural flow of scheduled project activities from inception to completion.

#### **H.3 AMRP schedules have not been quantity driven, although efforts underway seek to make them so. (*Recommendation H.5*)**

Schedules should contain sufficient detail to define the expected contribution to total estimated quantities to be installed, using clear production targets for each replacement project or group of such projects. The AMRP, however, has only recently begun to develop quantity-driven schedules that will begin to meet this need.

All in-house and contractor crews should remain aware of the production expectations underlying their work activities. Quantity-driven scheduling, now under development, will bring this

awareness a step closer to achievement. The effort remains underway. Four contractors must solve logistical issues in moving to such scheduling. AMRP management expects resolution of the problems in time to support schedule development and monitoring during 2015. Completing the transition to quantity-driven scheduling will also give Peoples Gas a single source of reporting for quantities installed. Management has not had this tool so far.

#### **H.4 Detailed work schedules of individual projects are consistent with higher-level annual plan schedules.**

Peoples Gas needs to develop and maintain its detailed work schedules in a way that provides consistency from the highest levels down to the schedules that guide construction work crews. The AMRP scheduling meets this need. The short-term generic schedules Liberty reviewed show consistency with higher-level schedules. The use of a well-respected tool in the industry (Primavera P6) supports such consistency. Liberty also found capable professionals in the AMRP scheduling function.

#### **H.5 Peoples Gas resource-loads detailed schedules for the internal workforce, but not contractors, and not for other work groups whose efforts support AMRP field work. (*Recommendation H.3*)**

Detailed work schedules should be resource-loaded. The Company's effort to do so for the work that its employee crews perform has a sound basis. Peoples Gas, however, has not implemented it with full effectiveness. The Company faces significant competition between the AMRP and other needs met with internal resources. Liberty did not find sufficient efforts to assess the adequacy of internal resources to meet all requirements, including, but not limited to AMRP work. The Company's history shows that the emergence of other urgent needs has diverted resources assigned to AMRP. Scheduling alone cannot solve that problem. However, proper and complete resource loading of AMRP work will permit a more informed understanding of the impacts of other work. Resource loading will also lay a foundation for considering the degree to which Peoples Gas should dedicate minimum levels of its resources to AMRP work.

Liberty also found construction inspection resource loading an area of concern. The Company has an appropriate target of one inspector per contract crew, but has yet to achieve it. More attention to the resource-loads of this inspection group will promote needed enhancement in efforts to oversee the quality and production of main and service installation work.

#### **H.6 The AMRP has not used focused analyses of the AMRP schedule delays experienced to date, and has not demonstrated a pattern of aggressive action to address such delays. (*Recommendation H.4*)**

Project activities experience delay for many reasons, some controllable and some uncontrollable. Construction management, which manages work daily in the field, discusses sources of delay in weekly progress meetings. Some of the problems encountered (*e.g.*, permit issues and securing property owner access permission), while repetitive, do not lend themselves to correction by crews. Liberty found no consistent effort to analyze the root causes of recurring problems and to recommend solutions to mitigate them.

## 4. Recommendations

### **H.1 Peoples Gas should develop a Scheduling Master Plan. (*Conclusion H.1*)**

The Company recognizes this need, and has begun a significant effort to develop a Master Plan. It needs to incorporate a master schedule plan that conforms to a well-defined AMRP scope and a newly formed, credible cost plan. To maintain this master schedule plan on a real-time basis, Peoples Gas also needs to develop the capability to assess how cost issues may affect schedule, and (vice versa) how schedule issues will affect costs at the AMRP program level.

### **H.2 Peoples Gas should develop a complete project schedule for every new project, and it should address all aspects of the work required, from engineering to construction and through completion. (*Conclusion H.2*)**

After four years, AMRP scheduling development has not matured at the pace required. Scheduling should address all major steps required to prepare a project for service. At a minimum, generic schedules should delineate, interrelate, and define the schedule requirements for: project selection, design, preliminary cost estimate preparation, contract bid and award, final cost estimate preparation, project authorization, City permit approval, permitting, material requisition, document control, work planning, field planning, construction scheduling, material delivery, gas main installation, services installation, gassing mains, meter and regulator installation, service cut-offs, restoration, inspection, and project close outs. Identifying and depicting all essential activities permits support groups to plan logically to ensure the availability of resources adequate to support projects on a timely basis.

### **H.3 Peoples Gas should resource-load schedules to address all physical work resources (including internal workforce and contractors) and construction inspectors. (*Conclusion H.5*)**

The Company needs to complete promptly the effort currently underway to resource-load the schedules for the internal workforce. Peoples Gas should load the lump-sum and unit-cost contractor resources into the schedule as well. This enhancement will give construction management the visibility to gauge the sufficiency of contractor resources. At present, AMRP management must wait until production falls behind schedule to identify resource shortages. The change will also give Peoples Gas the ability to assess, for long-term resource planning purposes, the comparative productivity levels of contractors. This information will support the development of performance targets, and assist Peoples Gas in assessing the benefits of and planning for the use of internal workforces to perform some main and services installation work.

### **H.4 Peoples Gas should regularly perform schedule variance analyses to identify recurring or systemic issues, and plan corrective actions. (*Conclusion H.6*)**

In 2014 alone, 108 out of 137 phases of projects experienced delay. This experience dramatizes the need for a timely and effective source of analysis of the causes that drive schedule delay. Peoples Gas needs to develop, and then regularly apply the capability to determine what impact uncontrollable events (*e.g.*, inclement weather) have had, and are likely to continue to have on schedule progress. It must then seek regularly to isolate the impacts of remaining influences. That isolation will enable management to determine which are subject to full or partial control, what

changes it will take to mitigate their impacts, and the costs of and benefits to be gained from taking mitigating actions.

The Company needs to understand all of the root causes that underlie schedule delays. It also needs to meet the challenge of gaining that understanding with the recognition that what appears uncontrollable at first can often be affected after full explorations of causation. Regular, ongoing analysis of schedule delay provides the basis for gaining that understanding and for planning and executing effective corrective actions. The permit problem with the City of Chicago offers an example. Schedule delays have caused deterioration of relationships with the City. Lack of permits, expired permits, and failure to perform restoration when and as required by the City caused a large number of permit violations.

**H.5 Peoples Gas should complete promptly its efforts to ensure that construction schedules become quantity-based for the internal workforce and for contractors.  
(Conclusion H.3)**

This recommendation may prove largely to be a function of resolving the logistics problems that four contractors now have in providing quantity-based schedules. At any rate, Peoples Gas needs to ensure that the effort to develop such schedules comes to fruition as soon as possible.

## *Chapter I Table of Contents*

Chapter I: Resource Planning .....	I-1
1. Background .....	I-1
2. Findings.....	I-1
a. Overall AMRP Craft Staffing Strategy .....	I-1
b. Master Craft Resource Planning .....	I-2
c. Craft Resource Management.....	I-3
d. Craft Availability .....	I-6
e. Craft Training.....	I-6
f. Engineering and Inspection Resources .....	I-7
3. Conclusions.....	I-8
4. Recommendations.....	I-11

## Chapter I: Resource Planning

### 1. Background

This chapter:

- Examines the overall strategy for planning AMRP craft resources
- Assesses the planning processes used to ensure sufficient craft resources
- Evaluates craft availability and training
- Reviews planning and staffing for the engineering and inspection resources required to support AMRP work.

Resource plans require close integration and consistency with cost and schedule plans. The assumptions driving resource plans require sound derivation, structured documentation, and continuing examination and revision as work progresses, and as experience with resource-related drivers grows. Plans for producing the particularly high AMRP production quantities contemplated also require careful consideration of resource availability. That consideration ensures that plans for acquiring resources recognize quantity and quality in relation to what the marketplace can be expected to offer. Liberty evaluated the AMRP's staffing strategies and the support underlying them. This review included the sources of work crews, productivity assumptions for the required categories of craft workers, overtime assumptions, and unit costs. Liberty's inquiries extended beyond direct construction resources to include support group resource adequacy.

### 2. Findings

#### a. Overall AMRP Craft Staffing Strategy

After approval of the Infrastructure Cost Recovery ("ICR") rider, AMRP management developed an overall annual installation target to increase replacement of high-risk gas mains from about 50 to between 100 to 150 miles per year. Averaging about 100 miles per year would put the AMRP on a 20-year completion course. At that time, crews consisting of Peoples Gas employees were performing most work needed to maintain the network (*e.g.*, addressing instances of leaks and corrosion). Contractors were performing most capital work. A basic principle behind this approach was consistency over time in internal resource numbers, while using contractors to perform work above the base, sustained level, and thus subject to variation. This strategy applies widely in the gas and electric industries. It can provide overall economy, and avoid disruptions that come with frequent increases and decreases in employment in affected positions.

What differs principally among utilities are the uses and amounts of contractor resources. At AMRP inception, management determined that contractors could perform main installation work more productively and with better quality. Making this approach work required the Company to work with its bargaining units to secure flexibility needed to make major portions of the significantly expanded work of the AMRP open to contracting. Management viewed that flexibility as providing a method for avoiding the need to procure major equipment and develop internally a suitably trained and experienced workforce to handle the much increased work load.

Peoples Gas secured two important changes; *i.e.*, a substantial compression of the bargaining unit progression system, and increased cross-assignment of personnel. Peoples Gas succeeded through

renegotiating an existing agreement in creating a new “utility worker” classification. It allowed craft workers with appropriate training to perform multiple types of work. New utility workers could attend a six-month training program that would significantly shorten progression through the hierarchy of bargaining unit positions.

Peoples Gas also secured some strike-related agreements that involve contractor use. The approach developed between the Company and the bargaining units provides for notice of labor supply needs that allows union efforts to ramp up resources. Workers would be qualified by the union, which would have the opportunity to supply the necessary resources. Should they prove unable to do so, the Company could acquire non-union workers to meet deficits. Liberty found no reason to believe that the management of relationships with the bargaining units involved has produced any resource constraints.

Peoples Gas did not undertake any structured or documented analysis in determining the contractor/employee strategy that has guided the division of AMRP work since program inception. Liberty did find it generally consistent with what one would expect as an overall strategy for providing the substantially increased craft resources and the major equipment needed to support the AMRP. It makes sense to continue examining the balance as the AMRP proceeds, recognizing that the division now existing has resulted from give and take between the Company and bargaining unit representatives.

To the extent that relationships remain sound, the benefits of continuing them in that form comprise an important factor to consider in examining any change in that balance. Effective resource management involves continuing efforts to examine the optimum allocation between internal and external resources. Liberty has found no such examination in the past four years. Program management believes that the present division between contractor and internal resources remains the optimum balance.

#### **b. Master Craft Resource Planning**

Peoples Gas has no comprehensive master resource plan for the AMRP. Such a plan would address resource needs as they may change over the life of the AMRP, assess their availability, and address efforts to fill potential short-falls. AMRP program management focused on the short term with respect to resource planning. Annual resource planning springs from the completed designs released by the Central Planning Group for immediate-term construction. The fairly recent decision to combine management of AMRP and non-AMRP work pursuant to the Qualifying Infrastructure Plant Surcharge requires consideration of total resource demands higher than when AMRP resource decisions considered just AMRP needs. Peoples Gas needs to plan combined demands together, but the approach to staffing from a planning perspective has been ad hoc. Liberty did not find a resource plan for either the immediate or long term.

Interviews with program management did not indicate conversance with structured notions of or approaches to long-term resource planning for craft or engineering resources. There existed a clear division of responsibility between the performance of the internal workforce and contractors. The utility has made efforts to develop a pool of resources, but its decisions and activities have not occurred in the context of a long-term AMRP staffing plan.



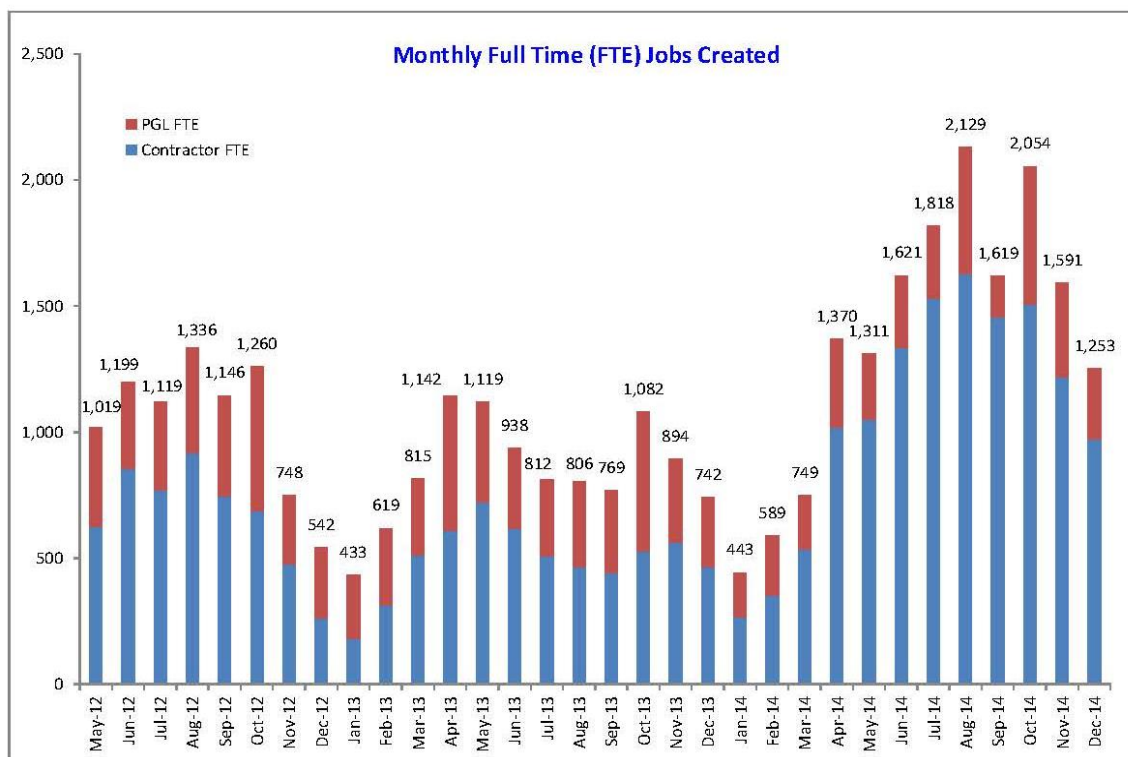
Peoples Gas currently does not have a suitably sophisticated range of resource planning tools. Recognizing the need for enhancements in resource planning, however, the program has recently brought on a resource manager. This manager will have responsibility for resource planning and management. Liberty anticipates that the new manager will be developing tools to support the exercise of these responsibilities.

### c. Craft Resource Management

As other chapters of this report make clear, contractors perform gas main installations (what Liberty has termed the “front end” of the process), while internal crews perform the back end work. The AMRP cost estimate reflects this division and actions concerning staffing conform to this strategy.

Liberty found, however, a lack of focus on resource management. AMRP monthly reporting provides a good example. The 42-page Monthly Status Report contains a single page devoted to resource information. As the following table shows, this page presents the split between internal and external full-time equivalent resources (“FTEs”). Even this limited information, however, raises questions about the degree of focus that exists on the use of AMRP resources. First, the chart shows the split on a whole-company basis. It does not address uniquely the resources employed on the AMRP. Second, the chart does not support any analysis of resource management, but rather seeks to show the number of jobs created. Job effectiveness and efficiency, rather than the raw numbers, are what is critical to AMRP performance optimization. This chart provides no ability to examine those critical factors.

**Chart I.1: AMRP Staffing Information Reported Monthly**



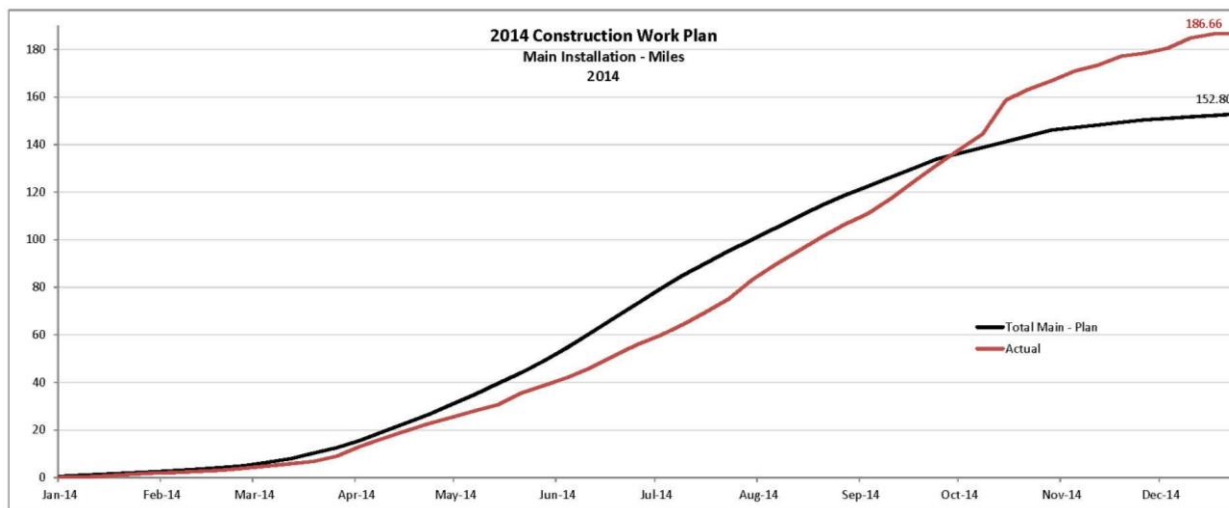
Liberty found no structured analysis of or plans for the use of overtime or multiple shifts. The AMRP considers shift work only during emergencies. The annual budget allows for 10 percent overtime. Liberty found, however, no formal guidelines addressing how the Company manages overtime levels for the various types of AMRP work. Management did not provide information responsive to our requests for historical overtime percentages. The response stated that AMRP management does not require contractors working on unit-price or lump-sum contracts to report work hours (straight time or overtime). The response also did not provide any overtime information concerning the internal physical workforce and other work groups. A follow-up question appears to confirm that Peoples Gas does not closely track or manage overtime.

The Company entered a new, five-year contract with Local 18007 in 2013. This agreement contains two provisions that should help increase daily production and reduce overtime:

- Craft workers now can report directly to the jobsite, which allows them to start productive work near the beginning of the work shift
- Craft workers can work across district lines, which facilitates prompt movement to locations with work waiting.

Sound productivity measurement comprises a central element in resource planning and management. AMRP reporting, however, focuses on production, without an emphasis on productivity. The Monthly Status Report exemplifies the totality of the focus on production, to the exclusion of the units of work it takes to support that production. The monthly report (see the examples in the tables below) displays quantities of mains, services, and meters installed.

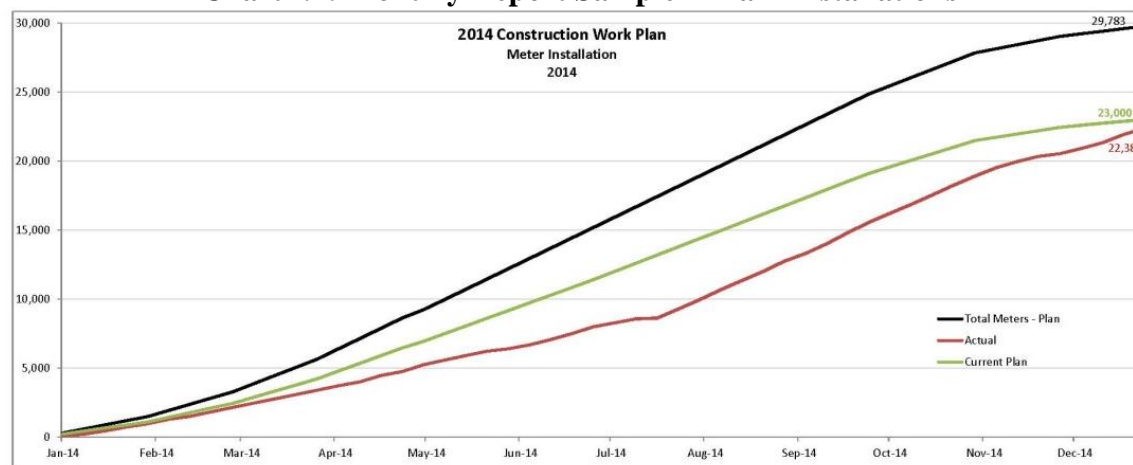
**Chart I.2: Monthly Report Sample – Main Installations**



**Chart I.3: Monthly Report Sample – Service Installations**



**Chart I.4: Monthly Report Sample – Main Installations**



Resource planning for a long-term program also requires consideration of productivity changes as work progresses through different stages. The current AMRP estimate places final costs at \$4.45 billion. The next table shows key labor unit costs it incorporates. Management applies the same unit costs for the AMRP’s full 20-year duration. Estimates do not reflect productivity changes over that period. Five-year ramp up and two-year ramp down segments should bring different productivity levels. Moreover, establishing and monitoring against a targeted productivity improvement level during the AMRP’s “sweet spot,” is appropriate. The AMRP requires regular monitoring of productivity and monitoring against more than a 20-year flat line assumption.

**Table I.5: 20-Year AMRP Unit Cost Rates Assumed**

Unit Cost Analysis				
Commodity	Unit of Measure	Historical (2008)	Original Estimate (2009)	Revised Estimate (2012)
Main Installed	\$/mile	387,750	439,511	706,297
Services Installed	\$/each	1,622	1,750	3,478
Meters Installed	\$/each	339	559	694
Main Retired	\$/mile		1,295,605	1,904,909

#### **d. Craft Availability**

Management expresses optimism about the long-range availability of resources, both internal and among AMRP contractors. That optimism is consistent with AMRP experience to date, but Peoples Gas has not supported its expectations of resource availability with any focused analyses or examinations.

A training partnership with the City Colleges of Chicago (a network of seven community colleges across the City) supports the ability to increase the workforce with reasonable dispatch, when circumstances require. The Company also views good relationships with contractor unions and the attractiveness of remaining in the Chicago area to workers as assets in securing access to resources. Participation in bidding on AMRP contract work has remained robust through the program's early years. Peoples Gas therefore considers the training school a sufficient backstop for securing needed apprentices through the training partnership.

The most recent construction season (during 2014) demonstrated a resource-based response to less than expected progress. Mid-year increases to contractor resources produced an acceleration in desired main and service installation rates. The increase would bring those rates to a level nearly sufficient to make up for a gap that grew during the first part of the construction season. This recovery effort, did not, however demonstrate integration with the back end work performed by Peoples Gas crews. AMRP completion work competes for resources with non-AMRP work performed by the same internal personnel. Despite early recognition of resource problems on the Peoples Gas side of the work, the Company was not able to make up for the lack of progress there.

#### **e. Craft Training**

Mechanics must complete four training courses (involving 168 classroom training hours) and four years of on-the-job training and experience to become fully qualified. The next table summarizes training and time requirements.

**Table I.6: Mechanic Qualification Training and Time Spans**

Title	Lesson Plan	Training Duration	Time Span
New Gas Mechanics	106LP02	5 days	1.5 years
Gas Mechanics +2 years (Pre-school)	104LP05	5 days	0.5 year
Gas Mechanics +2 years	105LP01	6 days	2.0 years
Gas Mechanics +4 years	102LP02	5 days	

As discussed earlier in this chapter, a new program covering “utility workers” now exists. The program resulted from collaboration with the Utility Workers Union of America (UWUA) – Local 18007, the UWUA Power for America Training Trust Fund, and the City Colleges of Chicago. The program has an affiliation with the Utility Workers Military Assistance Program. This program assists veterans to transform their military occupational skills into natural gas industry career opportunities. The Illinois Department of Commerce and Economic Opportunity (“DCEO”) acts as a program funding partner.

Participation in the utility worker program condenses much of the training that otherwise takes 10 to 12 years of skills development and safety training courses. A recently developed, full-time student program has a seven-month duration. Training covers all types of work, including the installation of mains, which contractors now perform. Instructors consist mostly of former Peoples Gas supervisors or lead craft workers.

Service veterans predominate among the students. That composition makes the group generally disciplined and committed. Peoples Gas guarantees graduates entry into the apprentice program. Assigned to mentors, apprentices ride with mentors as part of on-the-job training. The mentors evaluate readiness for entry into the permanent workforce at the end of 180 days. One measure of the program’s success is that only two students have failed to make the program to date.

Students can earn 52 Associate’s degree credits. Graduates receive a Gas Utility Worker Advanced Certification from a City College of Chicago. The program has produced some 150 graduates; 90 have accepted Peoples Gas employment offers. Mid-2014 enrollment included 19 students on track for summer graduation, with 25 more scheduled to begin studies at that time.

#### **f. Engineering and Inspection Resources**

Engineering and construction inspectors comprise the two largest groups that support work in the field. Neither group has resource plans. Neither do the other support work groups, such as planners and quality inspectors.

##### *i. Engineering*

Management supporting AMRP work describes its role as a reactive one. Liberty’s observations confirm this view, with engineering reacting to near-term demand without a plan or a comprehensive grasp on current or future resource status and needs. We could not glean from discussions with engineering management a firm grasp on longer-term work demands. Management cited City requirements changes and schedule, as opposed to resource-driven planning, as major sources of uncertainty in identifying workloads. Engineering thus has used reliance on contractors when needed. An effort is reportedly underway to lay out skill sets, training

requirements, an appropriate mix of engineers and designers, and the most effective balance of internal and external resource mix. It has yet to produce conclusions or resulting plans.

Engineering currently has five openings. Filling them has become an issue. Reportedly, the pending acquisition of Integrys reduced authorizations to fill the five openings to only three.

The Company uses a rotation program to enhance its ability to fill engineering positions. The program provides the Company's Illinois-based engineers with the opportunity to develop technical skills and expanding knowledge, while providing cross-functional business exposure. Engineers receive hands-on experience in key business areas, such as Distribution/Design, Field Operations Shops & Operator Qualification ("OQ") Training, Compliance, and the Centralized Planning Process. The Company's individual performance management program provides twice yearly reviews involving General Managers and Senior Leaders from Peoples Gas, North Shore Gas, and Integrys Business Services – Gas Engineering and Gas Supply. Rotation assignments offered as part of the performance management program consider employee performance, length of time in current assignments, past rotation assignments, and business needs in identifying rotation opportunities. There also exists a succession plan for key positions in the engineering organization, but none for the Project Management Office.

#### *ii. Construction Inspectors*

Six major contractors are installing mains and services for Peoples Gas. Construction inspectors should play a significant role in maintaining production levels and in ensuring schedule adherence. They should also ensure quality work. Liberty's field visits confirmed that the construction inspectors do conduct their work in furtherance of these needs. The program's approach of targeting one inspector per contractor work crew (of eight members) comprises a sound approach. Peoples Gas has difficulty, however, in filling the vacant construction inspector positions. The current inspector complement is 19 and there exist 16 open positions. Assigning one inspector per contractor work crew reflects a new approach. Inspectors have major construction supervision responsibilities. It takes time to select candidates with appropriate qualifications and experiences. Each inspector undergoes a reasonably thorough training program. Training includes two weeks of field shadowing and two months of classroom work. Class work includes modules such as Company procedures, as-built drawing accuracy verification, fusion work (making plastic pipe connections), and work orders, for example. Peoples Gas largely draws from a pool of its retired craftsmen or foremen.

### **3. Conclusions**

#### **I.1 The AMRP lacks the long-term resource plan required for optimizing long-term program performance. (*Recommendations I.1 and I.6*)**

A program like the AMRP requires resource plans defined by skill for each organization critical to production and to construction support. Peoples Gas has no resource plans. Some short-term planning occurs. Even that planning, however, confines itself to main and installation work performed by contractors and the work performed in the field by Peoples Gas crews. Other support groups, such as engineering and construction inspection, do not appear to use any resource planning, either short-term or long-term. One result has been understaffing.

The Company agrees that it needs long- and short-term resource plans, and that it needs to monitor performance against them. Company initiatives developed since discussions began last September between Liberty and executive management call for redefining the program organization structure, and populating it with resources identified through structured resource plans.

Peoples Gas also needs to address immediately its shortages of engineering and construction inspectors. The current practice of performing quality inspections of one contractor per quarter on gas main replacement, service installation, anode installation, cathodic protection, and directional boring does not serve sufficiently to ensure contractor quality. An enhanced contractor quality inspection program will thus also impose additional resource requirements.

**I.2 Consistent with the overall AMRP strategy, the Company's short-term resource plans make an appropriate overall assignment of contractor and employee roles, but do not properly identify internal personnel to install meters and contractors to perform main replacement, service installation, and ground restoration. (*Recommendations I.1, I.3, I.5, I.6, and I.7*)**

AMRP resource plans must identify where the utility will use external and internal personnel. The strategy the utility used to define the overall roles of contractors and internal resources is appropriate for the short-term. However, changes in resource availability in the future may leave the Company in a reactive mode. Peoples Gas cannot rely exclusively on the short-term plans to accommodate future circumstances.

Failure to develop more substantial levels of internal workers skilled in replacing mains and installing services will force near total reliance on contractors for the life of the AMRP. Should the future bring a tighter market for resources (as more utilities accelerate replacement programs) a lack of internal resources will threaten completion of the AMRP on the current overall schedule. Increased competition in the industry for resources may also pose cost escalation risk.

**I.3 The AMRP lacks a structured and analytical approach to determining optimum resource allocation. (*Recommendations I.1 and I.6*)**

The AMRP should, but does not, base optimum resource allocation on study and analysis of factors such as wage rates, productivity, work quality, and resource availability. Peoples Gas presently does not have the capability to perform such studies. Liberty expects that some capable managers have sufficient familiarity with the operations to perform such analysis effectively. Current limits with respect to data, however, would make any such analysis ineffective. The Company needs to begin developing this capability, and to support it through improvement in data quality and completeness.

**I.4 Resource plans do not consider overtime use and multiple shifts as a strategy for the internal workforce; Peoples Gas regards overtime for lump sum or unit price contractors as irrelevant. (*Recommendation I.1*)**

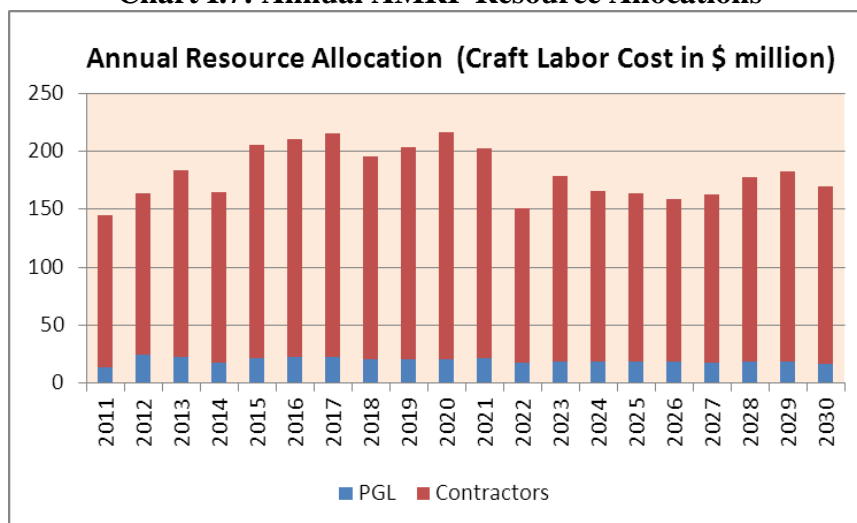
AMRP resource plans do not include a strategy for planned use of overtime, and, where appropriate, shift work. Workload should be translated into work-hours. A sound process for optimizing resource allocation must consider the internal workforce's straight time hours, its

overtime hours, and contractor hours. Failing to capture and use contractor work-hours, even under lump-sum and unit-price contracts, foregoes a valuable resource management tool.

**I.5 Peoples Gas' current resource plan assumes, probably correctly in the short-term, that there is no contractor resource availability problem, but relying on that assumption for the longer term is risky, as main replacement programs extend across the industry. (*Recommendations I.2 and I.6*)**

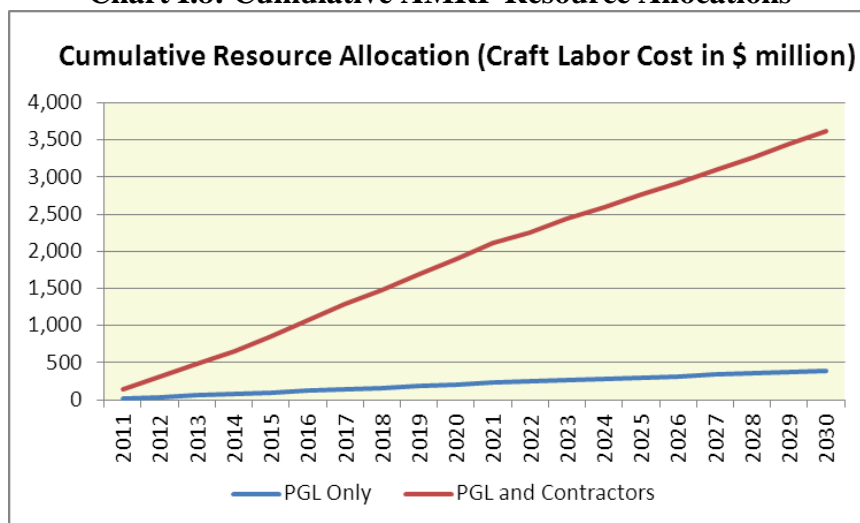
Resource plans should address how suitable staffing will be ensured long term. The next two charts show that the internal workforce is only going to perform about 10 percent of the work over a span of 20 years. The consensus within Peoples Gas is that contractor availability will never be a problem. However, Liberty believes that growth in demand for contractor resources (as natural gas use expands due to fundamental changes in price competitiveness and as other utilities tackle the massive amount of leak-prone pipe remaining in the industry) creates a real risk over time.

**Chart I.7: Annual AMRP Resource Allocations**





**Chart I.8: Cumulative AMRP Resource Allocations**



**I.6 Current, short-term resource planning considers craft and engineering training. (Recommendations I.1 and I.6)**

AMRP resource plans also need to address key training and development needs. Short-term training needs are considered. When the Company develops long-term resource plans, it must consider training and development needs. The replenishing of retired craftsmen provides one crucial piece of information in the resource planning process. Trainee ability and speed to develop into full-fledged operation qualified mechanics are also important factors to be monitored and managed.

**I.7 Current resource plans do not consider rising productivity, or monitor overall program productivity. (Recommendation I.4)**

The long duration of the AMRP makes it important to use productivity assumptions that match program phases, and that target improvement over time. Peoples Gas is developing a new AMRP Total Cost Estimate using a Planning and Forecasting Model under development. The model must incorporate rising productivity into the estimate. Likewise, the resource planning tool that the newly hired resource manager is charged with developing should take the expected rising productivity into consideration in future resource planning.

## **4. Recommendations**

**I.1 Peoples Gas should develop a long-term resource staffing plan that reflects the numbers, skills, and experience needs of all key positions. (Conclusions I.1, I.2, I.3, I.4, and I.6)**

The Company's long-term staffing plan should take into consideration workload demand, labor supply, attrition, retirement, training, and productivity. To ensure the adequacy of resources needed to complete AMRP work efficiently and timely, Peoples Gas needs to consider the merits of integrating planning and scheduling resources and processes.

The Company should create and use a workforce planning model that integrates workforce demographics, training requirements, resource acquisitions, attritions, expected retirements, and productivity variations. Such a model should have the capability to match these essential determinants with short-term and long-term workloads for planning, scheduling, estimating, and performance measurement purposes.

Peoples Gas is presently undertaking a long-term personnel planning effort intended to define resource requirements over the life of AMRP. This effort also seeks to optimize the balance between internal and external resources. The effort should identify core competence, transition, development, training, and recruiting needs.

## **I.2 Peoples Gas should develop the in-house capability to replace gas mains and install services on a larger and more long-term basis. (*Conclusion I.5*)**

Contractor availability has been sufficient so far to meet AMRP needs. Longer term planning needs to consider that many other utilities and their regulators face large inventories of high-risk pipe and long (some extraordinarily so) durations for eliminating them. The contractor availability situation can change materially and perhaps rapidly. The contractor workforces are facing a similar aging problem as well. That is why developing internal skills is important.

Peoples Gas should move toward increasing the use of internal resources for main and service installations. One model to use as a planning basis might be to set a target (*e.g.*, up to one quarter) of baseline AMRP work to be performed by the internal workforce. Working gradually towards that goal would allow the Company to verify that there are no adverse work cost or quality implications. Doing so would also provide some protection against potentially diminished contractor availability. It would also address more generally (*i.e.*, outside the strict confines of the AMRP) the need for sustaining suitably trained and capable resources in the wake of turnover in the current workforce.

Transitioning to such greater use of internal resources could begin, for example, under a structure that divides work as follows:

- For individual projects or phases of a project less than 1,000 ft. in length, assign to internal workforce
- For medium projects or phases of a project between 1,000 ft. to 4,000 ft. in length, award the work to the blanket contractors
- For large projects or phases of a project above 4,000 ft. in length, award the work to the major contractors via competitive bidding.

Initially, internal workforce performance may not be as strong as that of contractors, but a paced implementation of this approach, accompanied by close measurement of both internal and contractor performance, can serve to determine whether internal resources can perform competitively. This approach will also require some initial investment in vehicles and equipment and supporting personnel. Beginning modestly, monitoring employee/contractor performance carefully, and gauging how demand on contractors and their ability to respond are changing with time, however, will enhance the capability to deal with future threats to contractor availability, while working toward development of the resource capabilities necessary to address current, graying workforce issues more generally.

**I.3 Peoples Gas should act immediately to address the need for sufficient internal resources to perform back end AMRP work as planned and scheduled. (Conclusion I.2)**

Conditions experienced in 2014 with respect to work such as meter installation need to be avoided in the future. Meter installation is less affected by weather than are main replacements and ground restoration. Performance information at the shop level made it apparent that production started to lag as early as March. Peoples Gas was unable to perform sufficient actions to correct performance lags, despite regular attention to the matter by all three Shops.

**I.4 Peoples Gas should bring enhanced productivity measurement and management to resource planning. (Conclusion I.7)**

As noted in a number of this report's chapters, Peoples Gas has focused on production quantities, and not on the resources it is using to produce them. It is important to evaluate regularly and accurately the relationships between what is produced (output) and what has been used (input). This key metric can readily warn of AMRP program overruns.

Liberty examined a sampling of completed projects. The sample included 102 projects or phases of a project. Peoples Gas needs to monitor productivity in installing the three major AMRP components; *i.e.*, mains, services, and meters. The Company must, of course, know its cost performance in retiring mains. The charts below show program results to date, and provide an example of how the Company needs to monitor these unit costs.

**Chart I.9: Installation Productivity Measures**



These charts show the kinds of unit cost observations that require analysis and may, depending on the root causes for them, also require corrective actions. For example:

- Mains installed: overrun of 25 percent
- Services installed: underrun of 7 percent
- Meters installed: close to par, with a 4 percent underrun
- Main retired: overrun of 63 percent.

The sample size is small, but the exercise illustrates the importance of monitoring unit costs. Such metrics also have substantial importance in providing solid information for current efforts (focusing so far on developing a new cost model) to produce a comprehensive and credible forecast of final program costs.

**I.5 Peoples Gas should more closely monitor contractor resources and production.**  
*(Conclusion I.2)*

The Company should analyze every completed project or phase of a project to understand the root-cause of cost growth. This report describes elsewhere the importance of such analysis for cost management purposes. Here, its importance is in supporting sound assumptions about future resource requirements.

Peoples Gas must require contractors to report work-hours, even for unit cost or lump-sum contracts. First of all, calculation of safety metrics requires the information. It will enable the analysts to undertake wage range analysis and comparison. The work-hours will give the supervisors a greater sense of workload size. Managers will have increased ability to foresee where and by how much the schedule will suffer, should contractors put inadequate numbers of workers on the job.

**I.6 Peoples Gas should establish a centralized resource planning group or function.**  
*(Conclusions I.1, I.2, I.3, I.5, and I.6)*

Resource planning comprises a major and important function. The AMRP needs a group of planners with sophisticated skills. Peoples Gas should centralize this function:

- To analyze workload demands and coordinate the labor supply
- To evaluate the proper mix between internal workforce, overtime, and contractors
- To maintain the resource planning model mentioned in Recommendation I.1
- To recommend staffing strategies, crew allocation, contractor management, and timing of training requirements.

**I.7 Peoples Gas should evaluate regularly the performance (e.g., wage rates, quality, productivity, expertise, safety, dependability) of the internal and external workforce.**  
*(Conclusion I.2)*

Liberty understands the performance of internal workforce and contractors cannot be compared on a completely equal footing. Comparisons nevertheless need to be made, in order to optimize resource alignment. Bigger projects having greater lengths of main replacement generally have a cost advantage. If contractors offer more specialized services, they have an advantage that can lead to greater productivity. On the other hand, the internal work crews should be more familiar with the procedures and facilities and may bring a greater sense of “ownership,” which can produce a quality advantage. As long as work differences are understood, the insights gained from

comparison will be important in any rebalancing of work that leads to the use of internal resources for moderate portions of main and service installation in the future.

# Part Three: AMRP Management and Control

## *Chapter J Table of Contents*

Chapter J: Scope Control .....	J-1
1. Background .....	J-1
2. Findings.....	J-1
a. Overview .....	J-1
b. AMRP Scope Control at the Program Level.....	J-2
c. Scope Control of Individual AMRP Projects.....	J-2
3. Conclusions.....	J-3
4. Recommendations.....	J-3

## Chapter J: Scope Control

### 1. Background

This chapter evaluates the approach, processes, and activities for controlling the scope of work included in the AMRP.

Project managers generally recognize control of scope as a primary challenge on large, long duration programs and projects. Loss of scope containment often drives extensive cost overruns and long schedule extensions.

From a cost engineering perspective, the term “scope changes” has a narrow meaning. Changes under this definition generally involve items like design changes, adding of equipment and components, introduction of new project requirements, or expansion of project processes. For purposes of this report, Liberty has treated the subject of scope change more broadly. Liberty’s review considered any deviation from the project plan, other than performance or execution, that has an influence on program cost or schedule.

Effective control of scope requires a process of early identification of potential changes, definition of cost and schedule impacts, analysis of possible alternates, and an associated decision-making process. Given the risk of growth on a large, complex project, such a control system comprises a major priority.

### 2. Findings

#### a. Overview

The best performing organizations emphasize the control of scope at all levels of management. Implementing procedures tend towards more, rather than less comprehensive processes. An important source illustrates the industry standard for project management. The “Project Management Body of Knowledge” (“PMBOK”) affords Project Scope Management a full chapter of its own.

Liberty found scope control of the AMRP lacking. Liberty’s work disclosed no apparent processes or controls in place. Peoples Gas appears to view scope control as a contract administration challenge. Program management directs scope control activities at contractor requests for contract changes. Such attention to the contract process must form one important element of control. Changes in the overall program dimensions, processes, and requirements have broad significance as well, however. Contractor changes, significant in their own right, measure in the tens of millions of dollars per year. By comparison, changes at the program level can (and did) amount to billions of dollars.

The lack of a program-wide view of scope and scope management therefore represents a significant issue. The original program estimate has grown from \$2.63 billion in 2010 to \$4.45 billion in 2012. The new estimate, planned for 2015, will very likely exceed 2012’s \$4.45 billion. Management reports that much of the growth to date has resulted from scope changes, including changes in work methods, program requirements, and expanded program management.



### **b. AMRP Scope Control at the Program Level**

Liberty inquired about AMRP scope control on a number of occasions. The first inquiry requested “any AMRP processes intended to control scope.” Peoples Gas responded by providing flow charts of the field processes associated with contract change requests, including reviews and approvals of them. This response focused solely on contract administration challenges, but not the program as a whole.

A second, more direct Liberty request sought, “the process by which scope is controlled at (a) the AMRP program level and (b) individual project levels.” The full response to this question was:

*“Overall program scope is well defined and controlled via the five year plans and subsequent updates. Public Improvement Projects are also taken into account. Installation quantity is reconciled annually against remaining quantity to adjust plans for subsequent years.”*

This response provides an important foundation for Liberty’s concern about the lack of a process for program level scope control. This process should include at a minimum:

- A formal process for the identification of proposed changes as soon as possible
- A formal process for management review of:
  - Proposed changes
  - Impact on cost and schedule
  - Reasons why the changes are necessary
  - Alternates to consider in lieu of or to mitigate the proposed changes
- A formal approval process whereby:
  - Management approves defined changes and the associated funding
  - Those changes get incorporated into program controls, such as budgets and schedules
- A formal reporting process that provides for tracking such changes and managing them to the approved levels
- Adjustment of program cost forecasts to reflect the changes.

Liberty did not find these elements in its AMRP review. Liberty has not before seen a case where a significant project or program lacked a formal scope control program to support oversight and control.

### **c. Scope Control of Individual AMRP Projects**

Scope control at the project level also limits itself to contracts only. This approach does not comport with good practice. Peoples Gas reports that “at the individual project level, scope is controlled via enforcement of the contract documents.” Control of contract documents has clear importance, but does not alone provide a meaningful scope control system. Addressing changes in project scope only when and as proposed for inclusion in a contract document comes too late. Prompt identification of changes comprises an essential ingredient of effective scope control, allowing management timely control over how the change proceeds. Awaiting a contract document delays this process by months or more, surfacing issues only after work completion, or, at least, when the ability to avoid or mitigate the impact of change has become diminished or lost.

### 3. Conclusions

#### **J.1 The AMRP has not operated to date under an effective scope control program. (Recommendation J.1)**

Liberty found concerns with AMRP project-level scope control on two levels. First, the focus on contracts obscures management visibility with respect to changes originated through other means. For example, changes made in engineering often require incorporation into bid documents. Contract change controls will not identify them. Second, the time delay between a change and its evolution into the contract change process eliminates the possibility that it can be analyzed and mitigated.

A program like the AMRP requires a formal set of processes for the control of scope at the program and at the individual project levels. Scope control processes should focus on the early identification of potential changes, structured evaluation of the need for them, determination of their schedule impacts, and alternatives for addressing the needs underlying them. A proper hierarchy of required approval levels should exist.

The AMRP lacks these scope control attributes, instead maintaining that control of contractor change requests is sufficient. The narrow approach that AMRP management has taken does not comport with program needs or with Liberty's experience in the industry.

Liberty found no scope control processes at the overall program level. Some scope control processes do exist at the project level, but Liberty did not find them sufficient. The AMRP does seek to control scope at the project level, but only when changes directly affect a field contract. Other project-related changes (those not associated with an already-executed contract) do not face scope control processes. Also, by definition, changes associated with an already-executed contract may not come to management's attention until after options for addressing them are substantially restricted, if not gone entirely.

At the program level, scope changes may have been included and partially documented in cost estimate updates. Liberty, however, found no indication that they underwent analysis and approval processes.

### 4. Recommendations

#### **J.1 AMRP management should promptly design and implement a two-pronged scope control process: (a) at the program level, and (b) at the individual project level. (Conclusion J.1)**

Scope control processes should contain, at a minimum, the following features:

- **A baseline definition of scope:** The program master plan should frame this process, supported by associated documents such as estimates and schedules. The baseline scope serves as a control foundation only if well documented. The documentation must define underlying assumptions completely and include them in the plan.
- **A process for prompt identification of proposed changes:** Chapter K: Cost Estimating proposes a cost trend report. Those proposing or discovering potential changes air them

promptly. Immediate publication of proposed changes does not wait for details, cost estimates, or other, detailed supporting information. The process places a priority on prompt identification, so that management, if it chooses, can intervene before significant time passes, and options diminish.

- **Technical analysis of proposed changes:** Effective control requires an objective evaluation of proposed changes. Proposed changes often come in proposals by organizations with a high level of technical expertise. Proposals through an authoritative voice can tend to cause others to take them as “given.” Providing for technical analysis by a third party of commensurate stature supports sound analysis and alternative identification, which enables best-informed decision-making.
- **Cost and schedule impact of proposed changes:** Cost engineering personnel must evaluate changes for cost and schedule impact, and report them to management. Sponsoring organizations often underestimate these impacts. They either lack the ability to estimate them, or do not have awareness of the full implications that proposed changes may have for the project involved. Full and correct identification of the impact may lead to withdrawal of a proposed change. Even if a change occurs, management should understand impacts fully before allowing a change to proceed.
- **Documentation of management’s decision-making process:** Scope changes often serve as a principal driver of project cost increases. Management needs to be tasked with demonstrating that it handled such changes prudently. Making a full and complete record of management’s actions when learning of the proposed change and of management’s considerations in approving the change supports such demonstration.

## *Chapter K Table of Contents*

Chapter K: Cost Estimating .....	K-1
1. Background .....	K-1
2. Findings.....	K-2
a. Cost Estimating Procedures and Guidelines .....	K-2
b. Cost Estimating Function.....	K-2
c. Types of Cost Estimates .....	K-3
d. Cost Estimating Tools.....	K-4
e. Data Sources .....	K-5
f. Contingency .....	K-5
g. Cost Estimate Reconciliation .....	K-5
3. Conclusions.....	K-5
4. Recommendations.....	K-7

## Chapter K: Cost Estimating

### 1. Background

Chapter G: Cost Planning addressed longer term AMRP cost planning. This chapter, focuses on more near-term cost estimating. It:

- Describes the organization and resources dedicated to cost estimating
- Addresses the procedures and guidelines that apply to cost estimating
- Assesses the types of cost estimates produced
- Evaluates the tools and data sources used to produce and evaluate estimates
- Examines how management uses contingency to reflect uncertainty in project cost estimates
- Addresses the sufficiency of measures for reconciling estimated to actual costs.

Managing a program such as the AMRP requires current, comprehensive, and reasonably accurate cost estimates at the individual project level and at the program level. The primary function of cost estimating is to provide a standard or baseline for control and for managing performance. Meeting this critical need requires credible and rigorously executed estimating processes and outputs. Lack of a strong cost estimating capability creates a major impediment to effective cost management.

A comprehensive cost estimate starts with scope definition based on engineering design, quantities, required materials, labor costs based on past performance or productivity, overhead cost to account for all the supporting personnel, and contingency to account for shorter range uncertainties at the project level and longer range uncertainties at the overall AMRP level across its long duration.

Good estimating capability requires experienced cost estimators. They must have the capability and experience to visualize particular projects at a detailed level, understand direct and indirect requirements, identify comparable cost elements from previous similar projects, and adjust them for anticipated new conditions. The data sources for cost estimate development require regular updating and careful maintenance. Updating should occur at least annually and on a structured, comprehensive basis. Key inputs include historical productivity rates. An accessible and current cost performance database should contain historical data. Cost per foot of main, cost per service, and cost per meter installed provide examples of such data.

An effective cost estimating capability enables the following benefits:

- It provides managers a valid baseline to monitor productivity (measurement of accomplishments in relation to expected expenditures)
- It enables managers to receive early warning of potential project issues, thus supporting timely corrective actions
- It supports timely assessment of and response to changing conditions and emerging cost trends
- It can provide a final AMRP program cost estimate regularly updated and possessing a suitable level of confidence.

In summary, a credible estimate establishes a standard of performance that forms the basis for effective management of the work.

## 2. Findings

### a. Cost Estimating Procedures and Guidelines

No formal written guidelines or procedures exist to describe the AMRP cost estimating process. Project Management Office leadership justified absence of such guidelines, stating that the fairly straightforward nature of estimating makes establishing procedures a low priority. Liberty believes that an “anybody can do it” attitude makes consistent and credible estimating unlikely. Cost accuracy gaps that result from undisciplined estimating threaten effective capital program management generally. A disciplined approach has even more relevance in managing a multi-decade, multi-billion dollar, multi-project program like the AMRP.

### b. Cost Estimating Function

No dedicated organization performs AMRP cost estimating. The AMRP Cost Manager has responsibility for coordination and completion of individual project estimates and yearly budget estimates. The AMRP had no full-time cost estimator in its early years. Only after Liberty’s review started did the Project Management Office hire a full-time cost estimator from outside Integrys. Even after this hire, the organization misplaced the estimator by locating the position in the Contract Management Organization. Estimating must encompass a much more pervasive scope and set of responsibilities than those associated with contract management. Contract management is a critical component of AMRP project success, but a narrow one when all needs are considered. Estimating involves much more than contract management. It must operate in the broad context of all the interrelated activities that affect cost.

Section 3.3 of the Project Execution Plan, established at the inception of the AMRP, envisioned that cost estimating responsibility would begin with the engineering function. The Plan, however, anticipated a fairly promptly transfer (by the fourth quarter of 2011) to a project controls group. The transfer would occur as the Project Management Office developed its needed resources. The primary cost estimating responsibilities defined by the Project Execution Plan include:

- Perform cost estimating and management to meet design-to-cost objectives
- Develop a comprehensive cost estimating model for management of design, and provide alternate summary level cost data
- Perform detailed estimating for each project phase and work request
- Update cost estimating assemblies and templates at least annually
- Update Work Management Information System labor units costs (\$/hour) annually (by the Work and Asset Management team).

These intentions demonstrate that the Project Management Office contemplated the use of a professional cost estimating group, a formal cost estimating model, and annual updates of unit rates. Each of these factors form important elements of effective cost estimating, and in turn cost management. Peoples Gas has not, however, executed the original intentions, even after several years of AMRP operation. The Project Management Office Director explained the delay by citing an original intent to transition the estimating function from Engineering to Project Controls “as resources allow.” Failure to act in accord with the program’s early intentions with respect to estimating has set the AMRP back. The failure to follow through effectively meant that management treated AMRP estimating as it would other, less intensive, shorter-term work.

### c. Types of Cost Estimates

The AMRP uses three types of cost estimates.

The first type, the Preliminary Cost Estimate, covers an entire project or individual phases of projects that extend across longer time durations. These preliminary estimates emerge in a project's first stages. They come after the issuance of estimates of main and service work quantities. The design organization provides those quantity inputs. These installation quantities go into the Contractor Cost Estimating Template, sorted by size. Those responsible for estimating multiply these quantities by their corresponding, pre-determined unit rates. These historical unit rates vary with the range of available installation methods. Principal types of such methods include street open cuts, parkway open cuts, sidewalk open cuts, curb line open cuts, parkway directional bores, and sidewalk directional bores. Management has not kept this Contractor Cost Estimating Template up to date. It continues to use 2012 dollars. Following development of a contractor cost estimate, Peoples Gas adds 29 percent (a historically derived amount) to account for metering installation and other transfer costs. Management updates this adder annually. The Work Management Information System requires the development of these types of project cost estimates.

The second estimate type, the Final Cost Estimate, can also cover an entire project or phases of larger projects. Following completion of design, the Project Management Office sends bid invitations to contractors pre-authorized to bid on the work package. The value of the awarded contractor's bid becomes the estimate of construction costs. By this stage, clearing accounts have served to charge all engineering and support costs to the project. Material costs also become available. Peoples Gas applies a factor equal to 38 percent of these contractor costs (again using historical experience as a guide) to cover construction labor for back end work performed by internal Peoples Gas crews. Examples of such work include installation of meters and regulators and transfer of services to new facilities. Management updates this factor annually. This Project Cost Estimate guides the process of securing management approval to proceed with the construction of particular projects.

The third estimate type, the Three-year Spending Budget Cost Estimate, serves budgeting purposes. Peoples Gas began the use of three-year spending budgets following institution of the Qualifying Infrastructure Plant Surcharge. This three-year budget thus includes more than the AMRP. For each of the three years covered, two major categories of work apply; *i.e.*, AMRP and non-AMRP. Estimated amounts for AMRP main installation work for 2014, 2015 and 2016 include multiple phases of three major neighborhood projects. The estimated amounts for the next three years include Portage Park (Phases 1 to 10), South Austin (Phases 5 to 7, 9, 10 to 14), and South Shore (Phases 6 to 7, 10, 12 to 25). Estimates also exist for some High Pressure Project work for the next three years. Peoples Gas began these Budget Cost Estimates with estimates by the design group of the quantities of mains installed and retired, services installed, services retired, meters, low pressure to medium pressure vault retirements, and high pressure to medium pressure vault installations. The design group provided this information by year and by phase for these three neighborhood projects. The Company added (again using historical experience) a 25 percent management reserve to each construction cost category, in order to arrive at an estimated AMRP budget. The total budget amounts of AMRP and non-AMRP are identified separately.

#### d. Cost Estimating Tools

The Project Management Office has not produced a cost estimate at the program level (*i.e.*, AMRP wide across its full duration) in about three years. It has intentions of doing so now, but, as described earlier in this report, it has delayed a new estimate. Management cited the need to develop the capability to model costs sufficiently well to support such an estimate as the reason for the delay.

The AMRP does develop estimates at the project level for annual budgeting purposes. The Cost Estimating Template, an Excel spreadsheet, serves as the basic tool for supporting estimate development. The following illustration provides a copy of this template. As observed in a number of other cases, it assumed 2012 unit pricing levels.

**Illustration K.1: The Cost Estimating Template**

COST ESTIMATE - 2012 CONTRACTS							PEOPLES GAS NATURAL GAS DELIVERY	
WORK ORDER NO.:		RFI NO.:		FOA NO.:		Data Date:		
PROJECT NAME/NO.:				PHASE:		Run Date:		
MAINS INSTALL/RESTORE	QUANTITY (LF)						ESTIMATE	
	2"	4"	6"	8"	12"	18"	QTY (LF)	COST
OPEN CUT - STREET	DATA ENTRY FIELDS							
TRANSVERSE								
LONGITUDINAL								
OPEN CUT - PARKWAY								
OPEN CUT - SIDEWALK								
OPEN CUT - CURB LINE								
DIRECTIONAL BORE - PARKWAY								
DIRECTIONAL BORE - SIDEWALK								
NO. OF OPENINGS								
MAINS INSTALL/RESTORE								
SERVICES INSTALL	≤ 2"	> 2"	QTY (EA)		COST			
NO. OF SERVICES								
TOTAL ESTIMATE								
Unit Prices are based on Contractor 2012 Pricing / PLF Measurement								
	Open Cut Street		Open Cut	Open Cut	Open Cut	Directional Bore	Directional Bore	
	Transverse	Longitudinal	Parkway	Sidewalk	Curb Line	Parkway	Sidewalk	
2"	Proprietary Information Not Shown							
4"								
6"								
8"								
12"								
18"								
Assumptions:								
1) Mains installation & restoration is factored into the unit prices per rate table shown to right								
2) Excavation & shoring will be lump sum								
3) Railroad crossings will be lump sum								

The AMRP cost manager has developed a tool that he uses to keep track of the approved cost estimate of each project by phase, by work order, by contractor, and by budget year.



#### **e. Data Sources**

Compatible Units form an important element in comprehensive and consistent project cost estimating. These planning tools identify meaningful assemblies of material items, and associate them with labor and equipment requirements. The Project Management Office has not updated the materials portion of the compatible units in more than three years. Management cited resource shortages as the source of this long delay. Design engineers use a variety of factors to account for material cost inaccuracies that have become known.

Support costs also form an important part of effective cost estimating. The Company's financial system allocates the costs of supporting organizations on a monthly basis to active projects. The AMRP cost manager adds other overhead costs. Historical information (updated annually) serves as a guide for determining these overhead costs.

As discussed above, the construction cost portion of estimates uses costs as proposed by the contractor awarded work on the project. Program management has confidence in this approach, because bids from all the qualified bidders tend to have spanned a fairly tight range. However, Peoples Gas does not require the contractors, who perform generally under lump-sum or unit-rate contracts, to supply information traditionally used to monitor and manage performance (*e.g.*, work-hours, crew size, worker skill levels). Therefore, program management does not accumulate the information needed to assess independently contractor progress or effectiveness in managing work underway.

#### **f. Contingency**

The AMRP does not provide for contingency at the program level. The program does apply contingency for annual budgeting purposes, creating a funding reserve to cover contractor overruns. Those overruns result principally from contract change orders that must receive Peoples Gas approval.

#### **g. Cost Estimate Reconciliation**

The AMRP estimating process does not include a feature that incorporates follow-up analysis of actual costs. Such a feature would enable management to validate the quality of estimating methods, understand the drivers of unexpected cost increases, and address the nature and extent of those drivers. Examples of such cost drivers include scope growth, quantity changes, schedule delays, interferences, and productivity variances. In discussing initiatives to improve program management and oversight with Liberty, senior Project Management Office leadership cited imminent completion of a study performed to reconcile actual costs to project estimates. Liberty has not yet had an opportunity to evaluate the depth and quality of this study, or to determine what changes the organization plans to make upon analysis of the study results.

### **3. Conclusions**

#### **K.1 The AMRP cost estimating process is fragmented and lacking in attributes key to its use as an effective basis for measuring AMRP work. (*Recommendation K.1*)**

Each project estimate essentially consists of three different parts provided by personnel from three separate groups:

1. The design engineer normally estimates engineering and materials costs
2. The manager of the Cost Management Group adds overhead costs, which include the monthly allocation of charges from the personnel of all the supporting organizations
3. The Change Management Group provides the estimated construction costs, based on the awarded bid of the selected contractor.

A primary purpose of a cost estimate is to provide a valid cost monitoring base. The current AMRP approach tends to actualize the engineering costs, focus essentially only on the contractor bids, and rely on the expectation that time charges by Peoples Gas employees will fall in line with the historical assumptions used. The AMRP cost estimates developed have limited consistency, and do not promote confidence with respect to their use in providing effective cost management of individual AMRP projects.

**K.2 Data underlying the compatible units used to perform cost estimates do not have sufficient reliability, given the lack of regular updating. (*Recommendations K.2 and K.5*)**

Data sources used in estimate development need to be maintained and updated at least annually. Design engineers try to compensate for the failure to do so in different ways and degrees when performing AMRP work. Continuing to use 2012 contractor unit cost pricing for the Cost Estimating Template reflects another weakness, and supports the need for creating a dedicated cost estimating group to compile and analyze actual data of a repetitive nature.

**K.3 There presently do not exist cost estimating capabilities effective to meet AMRP needs. (*Recommendations K.1 and K.5*)**

No formal, written cost estimating guidelines or procedures exist. The cost estimating skills of the individuals preparing estimates vary significantly. In the absence of formal procedures and training, the quality of project estimates developed also vary greatly. The recent hiring of the first professional cost estimator for a program of this size reflects recognition of the need for improvement. One estimator will not prove sufficient, however, given the size, scope, and duration of the AMRP.

**K.4 Peoples Gas does not perform cost estimate reconciliations to understand and to deal with cost deviations, or to capture lessons learned. (*Recommendation K.3*)**

The Project Management Office does not undertake any structured analysis seeking to reconcile cost estimates with actual costs. Such analysis is necessary to secure understanding of why project actuals vary from expectations. Analyzing the sources of variances supports the identification of root causes, which management can then use to identify corrective actions.

AMRP management appears to consider the change management process governing contractor requests for costs increases sufficient to justify cost increases. This approach does not conform to best practice. Reconciling estimated and actual costs, even for fixed-price or unit cost contracts, comprises an important element in optimizing costs. Knowing what drives contractor costs is central to judging increase requests and to developing cost estimates for future work.

Liberty accepts program management's assertion that weekly field progress review meetings give an opportunity for lessons to be learned and to be incorporated into the planning and performance of future work. However, a systematic and programmatic approach to reconciliation on an annual basis will make the analysis more insightful, and promote a cost control culture and awareness among all contributors.

**K.5 The current cost estimating practice focuses on individual projects for the purpose of annual budgeting; as Peoples Gas recognizes, it has not had the capability to create (and therefore has not produced) a cost estimate at the AMRP program level. (*Recommendation K.4*)**

The Company acknowledged this gap as far back as September 2014, and has been working since, assisted by outside resources, to develop the modeling capability necessary to produce such an estimate.

## **4. Recommendations**

**K.1 Peoples Gas should establish a cost estimating capability by formulating a clearly communicated cost estimating philosophy, formalizing a cost estimating process, preparing procedures, and developing effective tools. (*Conclusions K.1 and K. 3*)**

Liberty and the Company began discussing planned initiatives to address central program management, control, and oversight needs last September. Peoples Gas has stated that actions to address this recommendation are underway. The urgency of addressing program cost, however, needs to be underscored, in order to accelerate the pace of implementation. Those efforts would be materially advanced by securing the services of outside, professional cost estimators (two or more for a period of approximately six months) to develop a programmatic approach, define processes and procedures, and provide training to those individuals performing cost estimates in the new organization that Peoples Gas plans to manage the AMRP.

**K.2 Peoples Gas should maintain and keep updated a set of historical databases that address cost estimating variables. (*Conclusion K.2*)**

Historical data should be collected and analyzed for at least the following key variables: installed quantities, unit costs, wage rates of craft workers, productivity, and the ratio of installed to retired pipe. Productivity information should include at least number of work-hours per mile of main installed, number of work-hours per service installed, number of work-hours per meter moved. Comprehensive and current information about these variables will improve the quality of future cost estimates at the individual project level. The information will also supply valid data for the cost model being designed and constructed to forecast final AMRP costs.

**K.3 Peoples Gas should perform project cost estimate reconciliations to understand major cost deviations, analyze performance and document lessons learned. (*Conclusion K.4*)**

This information will improve the ability of construction supervision to manage cost effectively by taking appropriate actions to improve performance.

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**K.4 Peoples Gas should expand the development of cost estimates at the individual project level and at the program level. (*Conclusion K.5*)**

Following sound development of cost estimates for individual projects, management can develop projected AMRP final costs in a bottom-up fashion. Improved costs estimates will permit easier and prompter detection of cost deviations at the project level. More effective and timely identification and execution of responsive actions and initiatives can then occur.

**K.5 Peoples Gas should establish a centralized cost estimating organization to maintain and sharpen the cost estimating skills. (*Conclusions K.2 and K.3*)**

The capabilities of estimate preparers fundamentally drive cost estimate quality. The recent hire of one cost estimator takes a first step, but not one that can prove sufficient by itself. Too much work remains to establish sound estimating, and then to continue executing it through the course of the AMRP. It will particularly take more resources to support the cost model being developed to restore the ability to forecast final AMRP program costs credibly.

Peoples Gas needs to hire at least one more cost estimator and one cost estimating supervisor to oversee the cost estimating activities required to support the AMRP appropriately. The new supervisor should report to the AMRP cost management director (a position discussed subsequently, in Chapter L: Cost Management).

## *Chapter L Table of Contents*

Chapter L: Cost Management .....	L-1
1. Background .....	L-1
2. Findings.....	L-2
a. The Focus of AMRP Cost Management.....	L-2
b. Managing Contractor Costs .....	L-5
c. Cost Management Organization and Personnel .....	L-5
d. Cost Management Systems and Tools .....	L-6
e. Cost Management Training and Support .....	L-9
f. Summary of Cost Management Capabilities .....	L-10
3. Conclusions.....	L-10
4. Recommendations.....	L-12

## Chapter L: Cost Management

### 1. Background

This chapter:

- Describes how management defines and approaches cost management and the management of AMRP costs
- Assesses the structure and content of the program through which management addresses the management of program and of project costs
- Evaluates the sufficiency of cost management organization, and resource levels and capabilities
- Assesses the sufficiency of AMRP cost systems and tools
- Examines the sufficiency of cost management training and support (or empowerment) within the AMRP management organization.

Modern notions of cost management have moved well past the traditional focus on simple collection and reporting of cost information. The traditional definition of cost management took much more of a cost “accounting” focus. What it generally lacked was the use of a professionally staffed cost management organization that: (a) combines cost analysis training and experience and knowledge of the underlying work, and (b) uses those abilities to determine how to contrast expected and actual performance to identify means for optimizing cost performance.

Best practice now involves the creation of an organization possessing substantial training and experience in cost analysis. The organization undertakes such analysis for the purpose of identifying how data collected about work execution suggests methods for improving efficiency and effectiveness. Such an organization needs to:

- Know what information to collect
- Have access to systems and tools for using it
- Possess sufficient knowledge of the nature of the physical work to make sense of the data
- Have sufficient organizational “clout” to make its work both available to and valued by program management and more senior levels of oversight
- Be continuously engaged in examining performance data, in order to identify trends, problems, and potential solutions before adverse performance has significant negative cost consequences.

Making the transition from the traditional, reporting-focused approach to cost management to an action-focused one requires what Liberty terms a “holistic approach to effective cost management.” This holistic approach begins with establishing and reinforcing the notion of cost as a major program or project priority. As noted, it also requires the establishment of a dedicated and experienced organization, not only to reinforce this priority, but to generate the information and examination needed to address cost analytically and aggressively.

The holistic approach that Liberty considers particularly important for programs like the AMRP turns in large part on recognizing and addressing the distinction between “oversight” and “control.” The distinction highlights the different types of skill sets of the people required, their

accountabilities, and management expectations. The distinctions between cost control and oversight include:

- Cost control is generally real-time (or in-process); cost oversight is generally after-the-fact
- Cost control is anticipatory; cost oversight is reactive
- Cost control focuses on managing costs; cost oversight focuses on reporting costs
- Cost control is integrally involved with work management and execution; cost oversight occurs at arm's length
- Cost control applies flexible guidelines; cost oversight more generally relies on rigid standards
- Cost control relies on good judgment; cost oversight focuses on conformity to procedure
- Cost control emphasizes analysis of the numbers; cost oversight recapitulates the numbers.

## 2. Findings

### a. The Focus of AMRP Cost Management

The AMRP's Project Management Office defined cost management in the traditional way, focusing overwhelmingly on simple budget monitoring. In other words, approaching but not exceeding budgeted expenditures served as the main method for defining success. Consideration of the efficiency and effectiveness of those expenditures (*i.e.*, the physical "value" received as a function of the dollars spent) had, at best, been secondary. Focusing on this budget-control metric means that tracking concentrated on success in matching budgeted total expenditures; *i.e.*, no more and no less than that budget. The existence of an accelerated cost-recovery method (more precisely, the limits it includes) would raise rate issues, should expenditures exceed amounts recoverable on an accelerated basis. Spending less (again, particularly considering accelerated recovery) would have earnings consequences.

Liberty found this simplistic approach unsuitable to AMRP goals and needs. Meeting the AMRP's public safety objective requires meeting production levels, whether or not they can be attained through budgeted expenditure levels. When expenditures fail to produce those production levels, cost management requires more than simply deferring work to the next budget period. It requires detailed and timely analysis of means for improving cost efficiency and effectiveness, in order to allow budgeted expenditures to produce greater production. It very frequently proves impossible to improve efficiency enough to meet production targets within budget. Thus, the second value in effective cost analysis comes in making informed judgements about how budgets must change to continue to support production targets, particularly in a long-duration program such as the AMRP. To the extent that the rate recovery structure forecloses consideration of this second search for improvement, the safety improvement objectives of the AMRP may become compromised.

AMRP management has stated that it does consider production levels a priority, but commitment to that priority is not clear. Liberty believes that the circumstances observed and the perspectives offered by program personnel indicate an approach that has the following dimensions:

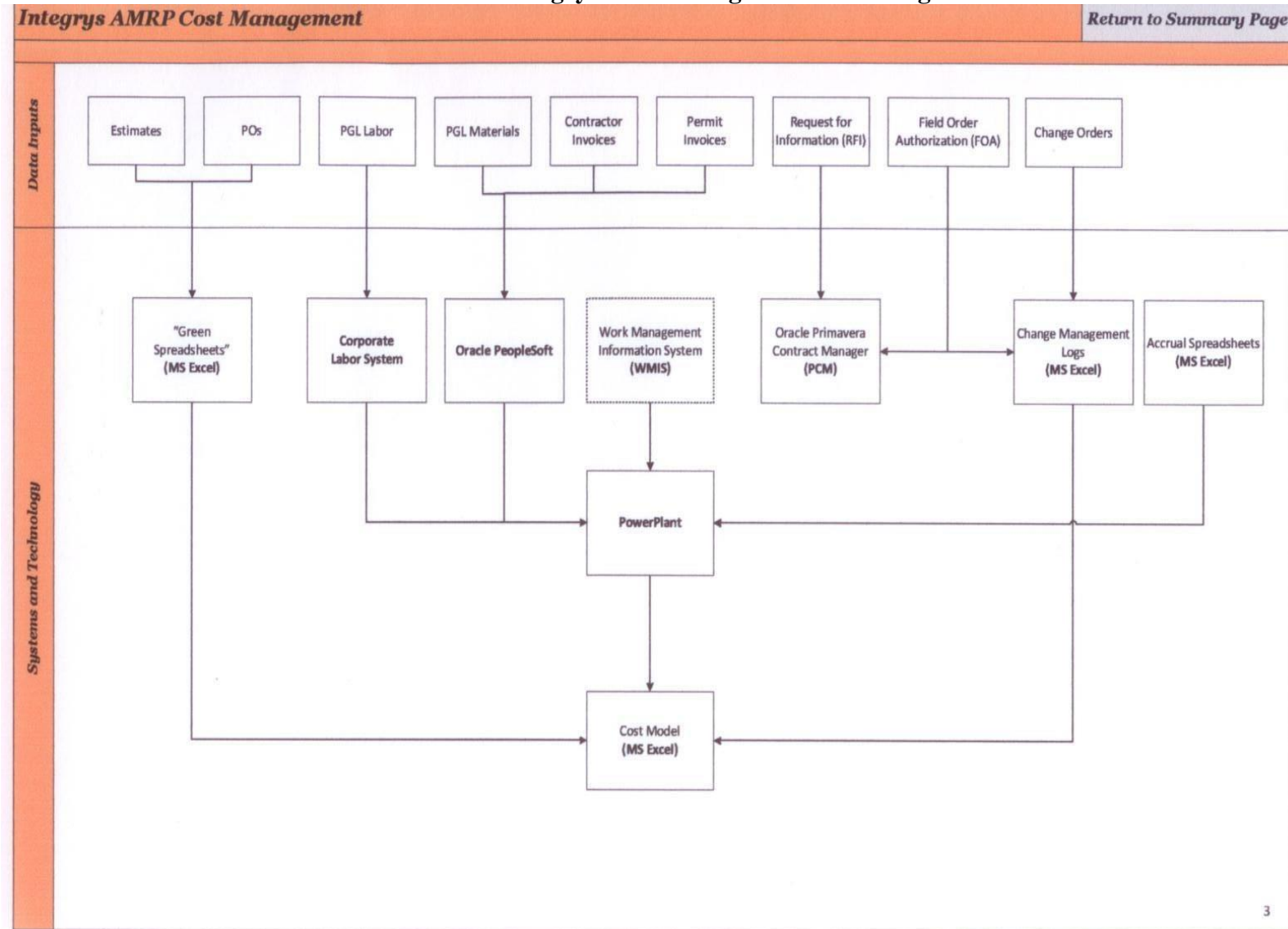
- Achieve the performance attainable for the fixed amounts budgeted
- Where that performance fails to meet targeted production or installation rates, rely upon the long remaining program duration to make up the gap.

AMRP management has approached annual work by awarding more work (to contractors performing gas main and service installations) than budgeted, while carrying over work planned for prior years but not completed. This approach reflects the hope that the result would be to attain the 100 miles per year target and to reduce the gap in production from prior years.

The chart below shows what AMRP management depicts as its cost management flow diagram. The diagram shows the sources of cost information and the systems that this information feeds. The diagram's lack of any analytical, feedback, or corrective action cycles illustrate the focus on cost reporting, as opposed to corrective action.



Chart L.1: Integrys Cost Management Flow Diagram



## b. Managing Contractor Costs

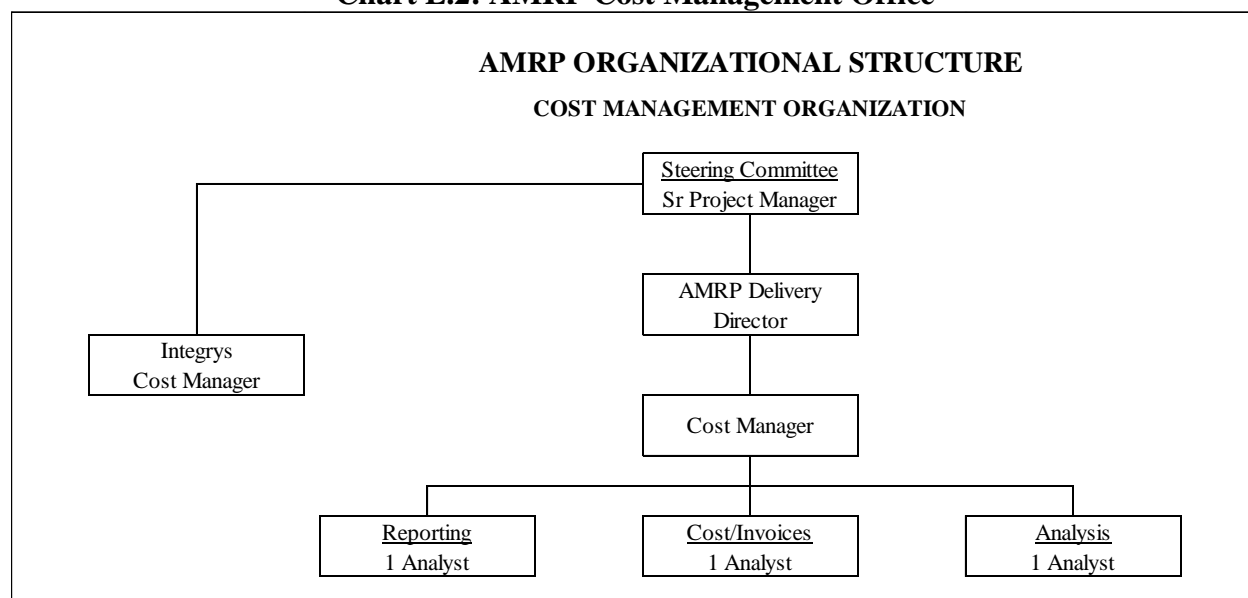
The costs of contractors installing gas mains and services comprise a primary driver of AMRP costs. Program management takes the view that lump-sum and unit-price approaches to contracts for gas main and service installation mitigate the need for active cost management. This view led to the belief that contractor costs present only a contract “administration” rather than a cost or construction “management” challenge. AMRP management considers that contracts using fixed or unit prices make the drivers of their costs (*e.g.*, labor unit costs, work-hours, productivity) the responsibility of contractors to manage. Peoples Gas does not require AMRP contractors to provide data addressing these drivers (the same as those influencing the costs of internal Peoples Gas resources). A broader and more appropriate view would require contractors to provide such data. Having such information would permit AMRP management to undertake effective analysis of field performance, evaluation of corrective actions, and forecasting of future project costs.

An example of the problem with the lack of such data came in 2014. AMRP management asked contractors to provide schedule acceleration plans after observing that work had fallen behind early in the construction season. Management should have had a sound set of data from which to evaluate contractor plans and resulting impacts. As it was, the lack of data forced AMRP management to rely much more on contractor conclusions than on its own about how to address the need to accelerate progress.

## c. Cost Management Organization and Personnel

The next chart illustrates the AMRP’s cost management organization structure.

**Chart L.2: AMRP Cost Management Office**



Management prepared a lengthy Project Execution Plan (PEP) at the outset of the AMRP. Chapter E: Plan for Management of this report discusses this Plan in more detail. The Project Execution Plan called for a Project Controls Group to have responsibility for cost forecasting and control,

reporting, scheduling, and document control services. Some of the cost control functions that this Plan specified reflect traditional cost control practices. Program management in 2013 split this organization into three separate groups, focusing on cost, scheduling, and documentation control. The Project Management Office Director made the split in order to provide better focus on what he views as three separate functions.

The change, however, led to gaps in responsibility. Some of the original cost functions (*e.g.*, forecasting and performance analysis) fell to other groups. Some functions were not performed at all due to resource limitations. The cost organization now consists of four individuals (the Cost Manager and three analysts). Direction reportedly comes from the Integrys Cost Manager, whose reporting relationship is at the senior oversight level; *i.e.*, above AMRP management, rather than to AMRP management. Liberty did not find substantial direction of AMRP cost management work by Integrys.

Liberty's discussions with cost personnel failed to disclose clear definition of roles and responsibilities. The Project Management Office Director and AMRP Senior Project Manager could not articulate with clarity what he expected of the AMRP Cost Manager's group, other than budget monitoring, assembling cost reports, and invoice processing. The Cost Manager (under the AMRP Delivery Director) came to the program within the past year. Liberty found the structure, role definition, and resource numbers dedicated to cost management insufficient to meet the needs of the AMRP. The group appears to continue to focus on the cost "oversight" role that Liberty considers too narrow to support AMRP needs.

#### **d. Cost Management Systems and Tools**

##### *i. Cost Model*

The AMRP had no functional cost modeling tool prior to the Integrys Cost Manager's assignment to this program. This manager had to track annual expenditures versus the budget on a spreadsheet. Recently, an outside firm developed an interim cost modeling tool. It uses MS Excel™ to automate the monthly cost reporting process, and to provide traceability for input data. The AMRP intends to use this interim model for cost reporting until an enterprise-level cost management tool can be implemented.

The input/output framework of this interim cost modeling tool operates as follows:

- **Inputs:** Provide the various data sources that feed the calculations, including annual budgets, project cost estimates, change logs, budget transfers, historical PeopleSoft data (contractor purchase order amounts, including change orders, with cross-references to work order numbers and Federal Energy Regulatory Commission Account numbers), PowerPlant cost outputs (actual payments to all vendors with cross-references to AMRP project names and phases, and work order numbers), and metering data.
- **Calculations & Outputs:** Calculate data from across the various input sources, primarily by work order number, with resulting data aggregated by project/phase or by cost account on both year-to-date and program-to-date summaries.

The next table summarizes the fundamental features of this cost modeling tool.

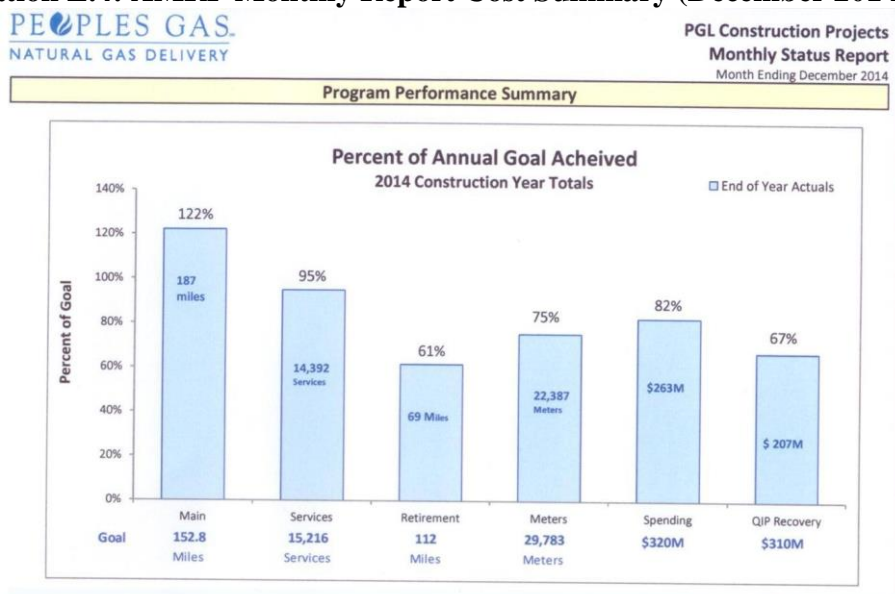
**Table L.3: Cost Tool Components**

<b>Component ("Tab")</b>	<b>Content</b>
Dashboard View	Highest level overview: year-to-date and program-to-date summaries of budget and contractor commitment information by major AMRP category
Project View	Project-level overview shows direct comparisons between budgets and forecasts and between commitments and costs, grouped by neighborhood and then by phase
Cost Model	Primary calculations from project and budget information; costs of unique Work Order number having an AMRP project name
Budgets	Input data from the annual budgets, showing AMRP budget allocation across cost accounts in the Dashboard View
Changes	Input data from the Change Management Log for all work orders (starting with 2014)
Estimates	Input data of estimates for all work orders (starting with 2014)
Budget Transfers	Manually input data reflecting approved budget transfers on a balance sheet of credits and debits
Metering	Input data from AMRP metering-related projects (starting with 2014)
Historical	Historical commitment input data from a PeopleSoft query (provides commitment information unavailable elsewhere); identifies commitments and change orders for projects carried over in 2014 from previous years
PowerPlan	PowerPlan query input data used to calculate actual costs associated with work orders
Reference: General Contractors	Names and vendor IDs of all active AMRP general contractors
Reference: Projects	Reference data for all unique projects and phases monitored and reported on
Reference: Work Orders	Reference data for work orders monitored and reported on

*ii. Monthly Status Report*

The monthly status report provides the program's "official" cost management information. The first page of this report provides a Program Performance Summary in the form displayed in the following illustration. The summary addresses 2014 progress at year end. This chart shows that Peoples Gas expended \$263 million in 2014 (82 percent of budget) to retire 69 miles of main (61 percent of the revised plan of 112 miles).

#### Illustration L.4: AMRP Monthly Report Cost Summary (December 2014)



The year end 2014 monthly report also contained a one-page summary of budget performance. The report, however, provided no explanation or analysis of the work and cost underruns that occurred. It did not discuss major issues affecting progress.

#### Illustration L.5: AMRP Monthly Capital Spend Summary (December 2014)



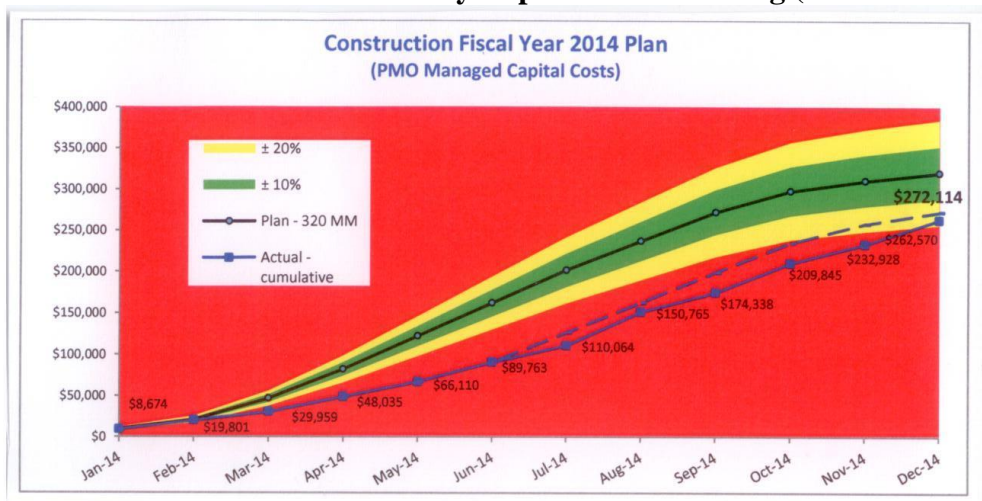
##### 15. Cost Summary

<b>PEOPLES GAS</b> NATURAL GAS DELIVERY		Date Date 12/31/2014		Revision Date 1/9/2014	
				<b>CAPITAL SPEND SUMMARY</b>	
Cost Account Description	2014 Original Budget	2014 Target	2014 YTD Actuals Work Complete (Spent & Accrued)	Current Month Actuals Work Complete (Spent & Accrued)	
<b>AMRP-Managed Capital Costs - Fiscal Year 2014</b>					
Management & Design	\$ 50,172,000	\$ 46,600,000	\$ 38,082,346	\$ 4,125,856	
Distribution Projects - Contractors	\$ 133,074,000	\$ 117,800,000	\$ 112,456,837	\$ 14,481,360	
Distribution Projects - PGL	\$ 45,000,000	\$ 27,800,000	\$ 24,941,085	\$ 1,284,241	
HP Transmission Projects	\$ 36,758,000	\$ 36,100,000	\$ 21,003,717	\$ 2,836,451	
Meter & Regulator Costs	\$ 29,996,000	\$ 22,100,000	\$ 19,678,000	\$ 1,507,042	
AMRP Public Improvement Projects	\$ 25,000,000	\$ 21,700,000	\$ 46,408,155	\$ 5,406,704	
<b>Total AMRP Capital Costs - Fiscal Year 2014</b>	<b>\$ 320,000,000</b>	<b>\$ 272,100,000</b>	<b>\$ 262,570,139</b>	<b>\$ 29,641,655</b>	

Following this summary, the December 2014 monthly report provides a chart, shown in the next illustration, tracking monthly expenditures. No discussion or analysis accompanies the chart. Work for the year started to fall in March (very early in the construction season), and had lagged further by June. Liberty, at that time, questioned management about corrective actions being taken. Eventually, management began a big “push” on main replacement and service installation by the

contractors to close the gap. This push substantially accelerated main and service installations. At the same time, limits among Peoples Gas internal resources prevented the Company from catching up on meter installations.

**Illustration L.6: AMRP Monthly Expenditure Tracking (December 2014)**



Effective cost management requires tools that can and continuously do supply management with early warning of potential problems. These signals must be accompanied by analyses that facilitate timely corrective actions. Simply tracking expenditures in numerical or graphic displays does not comprise effective cost management. There needs to be analysis of what work got accomplished for the money spent and the resources used, identifying both the positive and negative forces, factors, and events driving performance.

The use of a one-page, unrevealing cost summary in a 42-page monthly report evidences the narrow approach that AMRP leadership takes to cost management. Moreover, overly focusing on the current year can obscure positive and negative trends and development that emerge over a longer time. Liberty's inquiries failed to disclose the comprehensive set of cost data required to enable management identification of the causes of adverse cost performance and trends. The lack of such information comprises a major gap in identifying methods for optimizing program performance.

#### **e. Cost Management Training and Support**

Effective management requires that managers understand their cost management responsibilities and receive the training and support required to execute them. Liberty's discussions with managers and supervisors interviewed disclosed that no basic training in cost management concepts and techniques had been offered to them. This result conforms to a fairly common, but unsound presumption that managers somehow acquire cost management skills as a result of their general backgrounds and experience in operations and management. Most managers that Liberty has encountered do in fact operate with cost consciousness, and try their best to contain costs when making daily decisions and carrying out routine operations. Nevertheless, ensuring a consistent and sufficient focus on cost management requires giving this discipline a distinct cultural bent. Management must provide focused training and development. Best practices; *i.e.*, those called for



by the size, complexity, and term of the AMRP, demand no less in ensuring success in managing cost.

Liberty's interviews with Project Management Office personnel and (especially) management and supervision in the three Peoples Gas Shops, made it clear that those managing and supervising work are left to performing the cost analyses that they determine necessary and feasible, without support from the cost management group.

#### **f. Summary of Cost Management Capabilities**

Peoples Gas does not place a high priority on developing and maintaining a strong cost management culture. This lack of priority inevitably causes cost management capabilities to fall short. What distinguishes the situation here is the level of cost management focus that a program like the AMRP requires. Management operates under an overly narrow approach to budget monitoring, rather than robust cost management. Management has not provided proper tools and has left the cost management group understaffed and improperly organized. Roles and responsibilities lack definition and management has not communicated clear and comprehensive expectations.

Liberty found no substantial cost analysis. Even basic factors, such as root-causes behind the relative performance of the shops, the factors behind differing performance levels by contractors, dollars per mile results, and the evolution of costs over the AMRP's first few years remain unanalyzed.

Peoples Gas has very limited cost estimating capabilities and no formal written guidelines or procedures. As Chapter K: Cost Estimating details, Liberty found a fragmented cost estimating process, lack of maintenance of the compatible units used to perform cost estimates, insufficient numbers of professional cost estimators for a program of this size, absence of project contingency (and hence lower cost estimate accuracy), and no cost estimate reconciliation addressing cost deviations and capturing lessons learned.

Peoples Gas has not updated its original cost model, and finds itself presently (until completion of work now underway) without a cost model usable for forecasting the final AMRP costs.

Discussions between Liberty and senior executive management have led recently to initiatives and plans (whose development is underway, and in some cases at the execution stage) to address areas where Peoples Gas could make substantial improvement.

### **3. Conclusions**

#### **L.1 The AMRP has not employed a formal cost management program, leaving the function too weak to fully support program cost management needs and to contribute effectively to program cost optimization. (*Recommendation L.1*)**

The AMRP Project Management Office views cost management as essentially equivalent to budget-tracking. Spending to but not above the budget has formed the predominant goal of cost management.

Early program history made it clear that spending the full budgeted amount would prove unlikely. Progress during 2014 is consistent with that history. For example, management reduced the original 2014 goal of 153 miles to 112 miles. The December 2014 Monthly Status Report stated the year-end actual retired quantity was 69 miles. Regular program reports provide no analysis of the variance. All Liberty found was a statement indicating that 10 miles did not make an engineering submission deadline.

The Monthly Status Report overly focuses on annual performance. Longer-term AMRP program status information, such as program-to-date costs, program-to-date retired miles, projected final cost and schedule information is unavailable. The lack of such data makes observations about and analysis of trends versus expectations unavailable as well. The addition of non-AMRP work to reports addressing AMRP work in the first quarter of 2014 further limits the ability to assess true AMRP progress.

A program like the AMRP requires a structured, well-defined, and rigorously executed approach to managing costs. Such an approach includes defining the key cost elements, making clear how management will track and manage each, setting firm expectations for managers and cost support personnel, employing specific reporting requirements, setting clear expectations for the analysis of the data contained in each report, appropriately structuring a cost management organization, and providing the specific skill sets required. Peoples Gas has announced a series of initiatives to address these issues, and has begun work on many of them. It will take major effort and significant time to implement them, even if the Company gives them a high priority and dedicated resources.

**L.2 Concentration on contract administration and annual budgeting produced much too narrow a focus on cost management. (*Recommendations L.1 and L.2*)**

Main and service replacement work occurs under contracts with outside contractors who employ, secure, and manage the resources required to provide completed main and service installation work. The use of lump-sum and unit-rate price contracts led management to view contractor cost management from a contract administration viewpoint. Liberty found insufficient focus on labor costs, labor work-hours, hourly labor rates, productivity, and other such determinants of cost. The nature of Peoples Gas' construction contracts affects the way Peoples Gas should manage costs, but it does not diminish the need for Peoples Gas to manage costs actively. Specifically, management's understanding of the labor parameters mentioned above must produce a working knowledge of what drives costs and what deserves management scrutiny. Measuring the effectiveness of current performance and developing a sound basis for future cost expectations depend on such knowledge. Peoples Gas lacks the information needed to develop that knowledge.

AMRP management tracks annual budget performance principally from the perspective of total expenditures. Management appears to define cost management success strictly in terms of conforming to budgeted expenditures. A focus on rate recovery may well be incenting this view. Management has stated that production is a priority in its cost management framework. Liberty did not observe the kinds of cost tracking and reporting or the level of commitment to corrective actions that would demonstrate the commitment it takes to establish production as a material priority.



**L.3 Peoples Gas lacks the cost management capability needed to support AMRP needs fully. (*Recommendations L.3 and L.4*)**

AMRP Management has adopted too narrow a scope for cost management. The cost group is tasked to manage the annual budget, process invoices, and manage cost reporting. The roles and responsibilities of cost management personnel do not have clear definition. Staffing is not sufficient to meet the requirements of a robustly and appropriately defined cost management function.

Peoples Gas needs to define key cost elements, identify tracking methods, set clear and challenging expectations for managers and cost support personnel, identify and use specific reporting requirements, determine what is to be done with each report, establish and staff a much expanded cost management organization, and provide the skill sets required to make cost management effective. These baseline needs exist for any large program, and have greater significance for one of the scope, size, and duration of the AMRP.

**L.4 Peoples Gas lacks essential cost management tools. (*Recommendation L.1*)**

The cost modeling tool now in use was designed for use on an interim basis. Management developed it to track incurred costs and annual authorized spending levels. It is too labor intensive to maintain, and makes the process of ensuring data integrity difficult. Moreover, this tool's displays of performance to date (versus the current year) fail to include some performance data for periods prior to 2014. This gap makes the tool's accuracy questionable. The tool's design for tracking incurred costs also leaves it with limited value in managing total costs. The Company states that it recognizes the current tool as an interim fix only. Announced initiatives include expanding the capabilities of cost modeling to address the gaps.

**L.5 No formal training in cost management concepts exists to assist those with cost management responsibilities, and program management and supervision do not have access to designated cost support personnel to assist in analyzing cost and performance. (*Recommendation L.5*)**

The absence of a formal cost management program for the AMRP means that managers try to control costs under varying methods, according to their background and experience. The lack of cost management professionals produces a lack of needed cost analytical capability.

## **4. Recommendations**

**L.1 Peoples Gas should implement a holistic cost management program. (*Conclusions L.1, L.2, and L.4*)**

Meaningful AMRP cost management requires appropriate processes that professionals knowledgeable in both the work being performed and cost-related skills employ. These professionals need to analyze anticipated and actual execution of the work in a data rich environment. Comprehensive and accurate information enables them proactively to identify and secure management commitment and action to improve efficiency with the ultimate objective of optimizing expenditures.

This essentially holistic approach to cost management requires establishing and reinforcing the need to think about and to address that at a strategic and policy level, as opposed to an accounting level. Companies that succeed in this approach establish cost as a priority, design an organization and structure it to promote cost effectiveness, and integrate cost into the other management systems that guide a program and its projects. A shift in thinking must occur at all levels of program management, to encourage a move away from a narrow focus on numbers and reports and toward a structured use of expanded analysis and an aggressive set of actions.

To achieve the above goals, a holistic approach to cost management operating under the overall structure shown below is in order.

**Illustration L.7: Holistic Cost Management Approach Structure**



The holistic approach employs three main components:

- A guiding philosophy towards cost management, supported by strong executive commitment and oversight, operating through defined priorities and policies.
- A formal, structured cost management plan that defines how costs will be managed, establishes individual accountabilities, and identifies global issues (systemic and cultural) that require specific focus and methods.
- A comprehensive set of tools and tactics, which comprise the building blocks that facilitate effective implementation of the plan, including systems, metrics, analytical tools, measures, focused initiatives, implementing procedures, reports, analytical skills and predictive capabilities.

Given where Peoples Gas stands, it will take several years to move to a fully effective, holistic approach to cost management. This approach has high importance in optimizing AMRP costs long term. There are short-term and long-term objectives that can be achieved. Liberty provided a checklist (below) that offers a roadmap to developing such an approach, identifying the time frames applicable to each feature that the Company should seek to implement.

Framework	Short Term	Long Term
<b>(A) A Guiding Philosophy</b>		
Executive commitment	X	X
The priority of cost management	X	X
Independent oversight		X
A coherent statement of policy		X
A strong cost culture		X
<b>(B) Cost Management Plan</b>		
A well communicated plan	X	X
A formal process		X
Organizational responsibilities	X	X
A focus on Cost Control	X	X
A focus on cost drivers (80/20)	X	X
<b>(C) Building Blocks</b>		
A focus on analysis	X	X
A focus on corrective action		X
Credible estimates and budgets	X	X
A network of skilled cost professionals		X
Management system versus accounting system	X	X
Continuous improvement	X	X
Performance measures	X	X
Ties to individual performance		X
Effective cost collection		X
Targeted initiatives		X
Benchmarking		X

Effectively implementing a holistic approach to cost management begins at the executive level. Senior leadership needs to set a foundation, and provide clear direction. This direction communicates a guiding philosophy on how cost management fits in the Company's strategy. It also establishes where cost falls in the hierarchy of priorities. In most companies, it will not lie at the top, but it remains important for employees to understand how it does rate. Ignoring the question reduces effectiveness and makes the challenge of balancing cost against other priorities that much harder for managers.

The guiding philosophy will provide a framework for emphasizing management's expectations. It will define policies and priorities for employees. It will also put in place appropriate oversight mechanisms to assure executive management that the philosophy and its accompanying policies are being aggressively implemented.

The second key element of design comes through a formal, structured cost management plan, or set of plans. Such plans define how an organization will carry out the cost management function. This set of plans should define how costs will be managed, the organizational approach to be used, accountabilities, and any specific issues, including systemic or cultural cost issues that must be addressed.

The presumption that those rising to management levels will inherently have acquired cost management skills is wrong. The plan helps educate managers and support personnel on the actions expected of them and how the cost management system functions. It will not be a general document, and the plan for one organization is unlikely to serve another.

The third element resides in the set of tools used in implementing the program. These building blocks bring the cost management approach, foundation, and plan to life. They include the cost tools and reports that organizations traditionally use. These tools, however, only contribute to, but do not constitute, the end result. They neither comprise the whole program nor define it. Rather they combine with the other building blocks to deliver desired outcomes. Other blocks include the skills and capabilities of cost professionals, predictive capabilities, implementing procedures, focused initiatives directed at specific cost issues and the many other activities and capabilities necessary for effective cost management.

Peoples Gas needs to establish a new program for estimating costs in order to have the capability to project final AMRP costs reliably and on a continuous basis. The Company has been working for some time to create a new cost forecasting model. It has committed to creating a model that will bring the capability to estimate direct program costs and ongoing operating and maintenance costs. Peoples Gas needs to expedite completion of the model and to verify its reliability, which is critical to the production of meaningful capital and operating cost estimates. AMRP management then needs to use this new model to prepare expeditiously a new baseline total cost estimate for the program. Finally, AMRP management must also develop a structured approach, supported by an adequate organization, to continuous cost forecasting in the future.

**L.2 Peoples Gas should establish a structured, well defined approach to managing AMRP costs at three levels: the long-term total program outlook, the individual project level, and the annual budget view. (Conclusion L.2)**

Individual projects form the basic building blocks of the AMRP. The estimates for these individual projects must be improved. Program costs can then be established bottom-up by summing the projects (and/or phases of projects) completed, the cost estimates of the active projects (and/or phases of projects), and the projected costs of projects yet to be designed. The cost estimates of all the active projects need to be sequenced so as to feed the budgeting, scheduling, resource planning, and project management processes timely and effectively.

**L.3 Peoples Gas should define appropriate roles for cost management professionals, including all activities, responsibilities, and accountabilities important to holistic cost management. (Conclusion L.3)**

An effective organization must move beyond numbers and reports, so that it can perform meaningful analysis and identify corrective actions. Only people can make that translation of numbers to action. People skills and experience thus become the most significant contributors to success.

The defined roles of cost professionals, along with clear responsibility and accountability for performance in those roles include the following:

- Direct support to work group management, helping and encouraging management to carry out cost management responsibilities

- Continuing preparation of analyses that directly lead to recommended corrective measures
- Assuring that the case for cost is heard in balancing program and project priorities
- Providing a focus on predictive methods and techniques, early identification of cost threats and elevation of cost issues while mitigation remains an option
- Developing and implementing tools and processes that support cost management.

Peoples Gas must develop the requisite skills in its cost staff in a manner fully consistent with these new demands. The AMRP cost organization must become familiar with the technical details of the physical work. With time, such development efforts and integration of new skills will produce the staff of cost professionals required.

**L.4 Peoples Gas should establish a cost support organization that: (a) resides organizationally at a level and in a place consistent with treating cost management as a high program priority, (b) serves the cost management needs of all levels of management, (c) develops a force of skilled cost professionals and assures those skills are continuously improved, and (d) has overall accountability for the development and implementation of the cost management program. (Conclusion L.3)**

Organizational decisions by necessity must be carefully tailored to the particular traits of the entity involved. One should therefore avoid prescriptive recommendations on how to structure an organization. That said, Liberty's experience does lend itself to identifying approaches and methods that have worked in the past.

The most successful cost management organizations feature a high reporting level. Establishing organizational "clout" underscores the importance of cost and the credibility of the people responsible for the programs designed to manage it. Peoples Gas should place the cost management manager or cost director directly under the senior leader of the AMRP. In addition, the cost manager should have the flexibility to build reports as the cost organization sees fit. This empowerment will facilitate upward communication to executive management and the Board as the manager deems necessary. This placement of the cost management organization will leave no doubt as to its standing as a corporate priority. More importantly, analyses performed by the cost management organization must remain objective, candid, and free of influence from the organizations directly responsible for performing physical work.

In Liberty's experience, a matrix approach to cost management can work. A matrix approach is often dictated when a specialized skill is needed in a local organization but will be difficult to acquire, nurture and retain in that organization. This may well be the case for the cost professionals Liberty envisions as appropriate for the AMRP. They are needed at the local level, and should report to the local manager. They could have a "dotted line" relationship back to the central cost management organization, which would be their organizational "home." That organization would be responsible for their technical direction, supporting them with staff capabilities and providing training and career development.

Establishing a career path in cost management can be a valuable contributor to attracting and growing a strong cast of skilled cost professionals.

**L.5 Peoples Gas should provide training for managers, supervisors and cost support personnel in cost management techniques consistent with the holistic approach. (Conclusion L.5)**

Training proves especially important where expectations for managers and support personnel are high, as should be the case for a program such as the AMRP. Liberty's experience teaches that such training is welcomed by the managers receiving it.

Training is also essential to permit managers to make rational decisions about their information needs. For example, in developing Peoples Gas new cost management tools, such as the Primavera Unifier, the needs of managers must provide a critical input. However, in the absence of adequate training, it is difficult to see how managers can operate with full effectiveness in defining their needs. Peoples Gas should, therefore, consider cost management training a prerequisite to that new system's development.

**L.6 Peoples Gas should continue aggressively to pursue the recommendations made by Liberty in discussions leading to the interim report. (All conclusions from this chapter)**

Liberty recommended pursuit of the following cost management goals during discussions, which began in September 2014, with senior Integrys and Peoples Gas executive leadership:

- Promotion of a cost effective culture
- A cost management program that promotes a culture of program cost control
- Objective to go beyond cost tracking and budget performance
- Enhancement of cost estimating capabilities
- Development of cost analytical capability to identify root causes of major cost issues and quantify cost impacts
- Training of key managers, supervisors, and cost professionals on cost control and management concepts
- Documentation of corrective actions and resulting effectiveness
- Development of effective cost forecasting capabilities.

Peoples Gas states that it has committed to and begun several initiatives in response to Liberty-AMRP executive discussions. Most of the announced improvement plans appear designed to get a good handle on tracking actual costs, and managing the annual budget plan. Peoples Gas remains a long way from the holistic cost management approach (described in Recommendation L.1). Nevertheless, its announced initiatives reflect a sound start and should prove effective if pursued with diligence, and with recognition that baseline completion of the initiatives agreed to by Peoples Gas provides a foundation, rather than a completed structure.

The Company's cost management do not take a program-focused, long-term view. The near term activities are designed to get a good handle on managing the annual budget plan. That is appropriate as a first step, but Peoples Gas will need to move beyond the current focus on cost tracking. Discussions with leadership indicate that further planning details of the cost management initiative will be forthcoming.

Liberty nevertheless, is not prepared to express optimism about the very near term prospects for reaching what we would describe as a holistic cost management program. For one thing, Peoples

Gas lacks the cost management capabilities and resources required to implement such a program. In addition, current circumstances still preclude a credible estimate of total costs over the AMRP's total duration, despite efforts to develop new cost modeling capabilities. As noted above, a full transition to a more holistic approach to cost management, while warranted as a measure to optimize long-term AMRP performance, may prove a multi-year effort for Peoples Gas, considering its current philosophy and capabilities.

## *Chapter M Table of Contents*

Chapter M: Procurement and Contracting .....	M-1
1. Background .....	M-1
2. Findings.....	M-1
a. Procurement .....	M-1
b. Contracting.....	M-4
3. Conclusions.....	M-8
4. Recommendations.....	M-10



## Chapter M: Procurement and Contracting

### 1. Background

This chapter:

- Describes the approach taken to material purchasing
- Examines the organization responsible for material purchasing
- Assesses material purchasing effectiveness
- Determines how well material availability has supported construction
- Addresses the contracting strategy for the AMRP
- Assesses the organization responsible for contractor management
- Evaluates the sufficiency of contractor management.

The purchasing of routine materials for a large project or program usually remains in the background, unless issues in material availability affect construction. Most utilities have developed reasonably sophisticated supply chain operations. One does not often find significant issues with the procurement of standard materials. The AMRP relies on a great deal of standard, rather than specially engineered, materials. Regular reports of purchases for the AMRP show very large numbers of purchases and of volumes of mainly standard materials. There is thus nothing particularly unusual about materials procured for the AMRP, except for their volume, which in turn produces substantial aggregate costs.

Contractors provide most AMRP labor. Their work on mains and services makes up 83 percent of the current AMRP cost estimate. Labor does not comprise this entire amount, but contractor labor illustrates the vast impact of contracting on the AMRP. The effectiveness of contracting and contractor management thus comprises a material contribution to AMRP success.

The potential for twenty years of contracts featuring largely repetitive work should present valuable opportunities for contractors. Significant opportunities therefore exist for Peoples Gas to obtain the best available skills at a reasonable cost, and to forge long-term contractor relationships that can assure an effective and efficient flow of resources.

Selection and management of contractors requires a mature set of skills. Contractors prove creative in rationalizing the need for work delays and extra costs. Management must routinely discourage such creativity and minimize cost exposures through strong management of contractors and the contracting process.

### 2. Findings

#### a. Procurement

##### *i. Overview*

The Integrys Supply Chain organization exercises responsibility for procurement through its materials management group. This Green Bay and Chicago-based group has 63 employees. Blanket purchase orders comprise the predominant means of securing materials for the AMRP. Various electronic systems, including the Advanced Planning System (“APS”), support materials

procurement. This system provides information on the needs, inventory, lead times, and other factors important in determining what materials to hold available in storage. The Advanced Planning System automatically places the order for project materials based on demand signals it receives from engineering, whose design work identifies the near-term installation quantities that drive needs for materials.

The materials management group aggregates material requirements estimates to produce aggregated materials forecasts, arranges logistics and transportation of materials to the job, and manages freight, warehousing, investment recovery (salvage), and inventory.

Engineering conducts design work that defines materials requirements, and enters these requirements into the Work Management Information System. Detailed bills of materials list the final material requirements for projects and other jobs. A need date corresponding to the start of construction is specified. Much of the material requirements consist of stock items that the materials management group obtains, and places in storage until drawn from inventory by a contractor or Peoples Gas crews for a particular project. Systems specifically track materials during installation by lot, identified by a number printed on the material.

The Supply Chain group operates warehouses throughout the Integrys property. These warehouses hold materials prior to their need dates at job sites. Supply Chain tracks quantities and needs, and replenishes materials as necessary. The City of Chicago permits no job site storage of materials when work is not actively underway. AMRP contractors therefore also require storage remote from installation locations.

Interviewees all stated that they had no substantial issues with the materials processes, which they believe have worked well. These interviews include the work of Liberty's field inspection team at job sites and in interviews with field supervisors and managers. Liberty's field inspections also failed to identify any materials inefficiencies associated with a lack of material availability at job sites. Supply Chain expressed continuing confidence in being able to meet the high volumes of materials that the AMRP will continue to require. The significant challenge (one common to the construction industry) comes when dealing with changes that generate materials requirements revisions in the field.

#### *ii. Material Delays*

A critical bottom line for procurement is the extent to which materials do not arrive in the field when and as needed. Peoples Gas identified 17 cases during 2013 and 2014 when materials were not available as required. The following table briefly summarizes their causes. Considering the magnitude of the AMRP effort, the number of shortages does not raise concern. The "change in standards" and the "operational preferences" items do not appear excessive. Moreover, they were supported by appropriate explanations, with some arising from outside forces. On balance, the data and Liberty's direct observation support a conclusion that material availability adequately supported AMRP progress.

**Table M.1: 2013 and 2014 Instances of Materials Shortages**

Number of Occurrences	Cause
5	Change in standards
5	Vendor delays or extended lead times
4	Demand exceeded anticipated or past usage
3	Operational preferences
1	Wrong material ordered by operations
1	Inaccurate ready date

Total (19) exceeds number of incidents due to two dual cause incidents

*iii. Strategy*

The size and duration of the AMRP present large challenges, but also offer substantial opportunities in a number of areas. Procurement would appear to provide a source of advantage. The AMRP involves large quantities of materials stretched out over a 20-year timeframe. Volume and duration should allow Peoples Gas to obtain most-favored status in the form of lower prices, better service, and long-term partnerships with important vendors.

Supply Chain management indicates that it seeks multi-year deals on materials, which would further the objective of optimizing performance. Management does not, however, appear to pursue a focused strategy that: (a) fully recognizes the buying power of Peoples Gas, (b) identifies where and how benefits can and should be sought, and (c) builds resulting tactics into the procurement effort.

*iv. Procurement Systems*

Three systems support the process of ensuring the materials support that the AMRP needs. First, as noted above, the Work and Asset Management System captures the materials required from the input of design information. Next, the Advanced Planning System aggregates materials required for all projects entered into the Work and Asset Management System. This information forms the basis for materials and equipment ordering. A PeopleSoft module captures the balance and the value of material and equipment available. The PeopleSoft module permits material and equipment status reporting, which regularly takes two forms.

- Fulfillment Rate, which tracks demand against supply, targeting a 95 percent on-time delivery rate
- Inventory on Hand past Due, which tracks how much material remains on hand after the dates expected for it to be required based on design information entered.

The first of these measures provides an indicator of whether too few materials are on hand. It does so by reporting failures of delivery when scheduled. The second provides an indicator of surplus material and equipment. It does so by reporting whether materials remain on hand after they were expected to be removed for delivery to job sites.

Liberty reviewed fulfillment rate charts for the last six months. This review demonstrated that procurement supported Peoples Gas needs, including AMRP requirements. Deliveries meet or exceeded the 95 percent on time fulfillment target regularly. The system reports this information

for eight different utility business units, all of which experienced fulfillment rates comfortably above the 95 percent level.

Liberty also examined the Inventory on Hand Past Due metrics. They show past due amounts of about \$1.5 million for the period since AMRP start. This amount covers all of Peoples Gas, but a very substantial portion of the amount appears assigned to AMRP projects. A very large portion of this \$1.5 million appears to have accumulated in 2014, when early construction season delays commonly occurred. The amounts may thus relate principally to these delays. Nevertheless, the numbers indicate a need for regular reporting of procurement metrics such as these. Such reporting will ensure timely material and equipment delivery without purchasing too far in advance of realistic construction start dates.

These metrics confirm the observations of Liberty's field inspection team. The team found material and equipment availability to pose no problems in completing work inspected. The metrics also confirm observations shared by field personnel, who reported that a period of some availability shortage in 2013 has not recurred since. The second metric provides an indication as well that suitable availability has not come at the expense of an overly conservative and potentially costly overstocking approach.

## **b. Contracting**

### *i. Organization*

The Integrys Supply Chain organization conducts the contractor procurement process through its strategic sourcing group. This Chicago and Green Bay group has 25 employees. The group assembles the bid packages, but evaluation of bids falls under the responsibility of the Project Management Office. Following contract awards, this Office has responsibility for contract administration.

Contract crews perform construction and installation of mains and services, and have responsibility for full restoration work behind their crews. Management seeks to assign contract inspectors to every project. Construction management provides day-to-day direction of contractors. This assignment leaves administrative tasks as the Project Management Office's primary responsibility. Administrative tasks include contract administration, negotiation of contract changes, and review and approval of invoices.

### *ii. Strategy*

Peoples Gas chose a strategy that relies heavily on contractors for most parts of the AMRP, including essentially total reliance on them for main and service installations. Such a strategy makes sense, although Peoples Gas has not provided any analysis supporting it. More importantly, Peoples Gas has not offered a strong implementing strategy; *i.e.*, one which will extract the most value given the attractive nature of the workload to contractors. Peoples Gas explained its contracting strategy to Liberty as one of "packaging" into contracts. Contractor selection is based on work volume, resource availability, the need for specialty subcontractors, and project performance. Contract packaging applies the following criteria:

- Project Duration

- Work scope for completion within one construction year (management, however, does design work into packages that permit awarding more work than can be completed in a calendar year, in order to support construction flexibility)
- Geography
  - Distribution of work across all three Peoples Gas districts (North, Central, South)
- Contract Value
  - Work bundled into packages appropriate to bidder ability, based on experience and resources
  - Small projects (*e.g.*, Public Improvement Projects) bundled to create cost effective packages to manage
- Resource Availability
  - Large projects broken into multiple smaller components to move work to smaller contractors with resource capacity.

The Peoples Gas “2011-2012 AMRP Construction Strategy – White Paper” states that “PGL implemented a competitive bidding strategy aimed at extracting value from the contracts based on construction volumes.” Liberty found no clear evidence, however, of how the Company did so, or of what success its strategy had. The Company reported in this regard that:

- It grouped projects into bundles based on work complexity and quantity, so both large and smaller contractors could participate. In addition, the Company broke bid bundles up or reorganized them, based on bidder feedback and resource limitations due to existing work for Peoples Gas. For example, a contractor’s capacity limitations due to ongoing work could lead to re-letting a bid package in smaller pieces, although the Company states that this approach does not usually lead to a re-bid.
- This approach has succeeded according to the Company; the contractor pool has increased from four to six; contractors remain busy according to their resource availability, and contractor costs have proven competitive and relatively stable.
- Future plans continue to seek development of the contractor pool to expand available contractor resources, and to maintain stable cost structure.

The AMRP’s long-duration and multi-billion dollar budget should encourage contractors to form partnerships with Peoples Gas. Liberty expected reasonably lower prices, higher efficiency, higher quality, better performance, and strong working relationships to result from such partnerships. Contractors have significant incentives to conduct themselves in accord with this long-term opportunity. Liberty did not, however, find substantial indication that Peoples Gas has tried to reduce contract labor costs using the advantages present. Supply Chain indicated that it has sought multi-year deals with material suppliers. The group has, however, shown reluctance in applying a similar approach with contractors. Supply Chain finds the pool of contractors in the Chicago area too limited. Liberty does not necessarily agree that this is a limitation. Peoples Gas expressed confidence in the current and long term ample supply of contract labor. Liberty has seen no evidence that Chicago is a labor seller’s market, and continues to believe that the AMRP represents a buyer’s opportunity.

Liberty believes that other approaches, apart from long-term deals, exist to encourage contractors. Without pursuing a more direct strategy towards this objective, Peoples Gas cannot assure Liberty or the Illinois Commerce Commission that it is optimizing AMRP efficiency for the long term.

*iii. Management of Contractors*

aa. Contract Administration

In exercising its role in contract administration, the Project Management Office appears to limit its primary efforts to change management (discussed in the next section below). Liberty reviewed typical AMRP field contracts with the intent of discussing their administration with program personnel. That review did not find the responsible people, including those from program management, contracts, scheduling, and construction, substantially aware of contract terms. Specific areas where Liberty found this lack of awareness include:

- The contract mandate for each party (Peoples Gas and the contractor) to name a Relationship Manager, and the identity of that person for each contract. The Relationship Managers serve as each party's primary liaison with the other, and act as each party's representative for the resolution of disputes. This requirement is important. The Peoples Gas representatives should know who is responsible to speak and commit for the contractor. Further, the contractor may not charge for this function. Peoples Gas cannot enforce the requirement if it does not know who the person is.
- The nature, or even the existence of, the contract mandated Joint Steering Committee and its mandated quarterly meetings.
- The nature, or even the existence of, the contract mandated annual executive meetings. This requirement, together with the previous requirement, establishes the governance structure for the work, and thus proves important in establishing the framework for management and ultimate accountability.
- The nature of mandated contractor reports. Contracts define reporting requirements, as well as monthly progress meetings and required attendees. Proper reporting maintains an adequate management process, and assures a uniform approach by each contractor.

These requirements address central elements of contractor management. Liberty's review, however, found key AMRP management people unaware even of their existence.

bb. Contract Change Management

The Contract Manager group in the Project Management Office, staffed predominantly by Jacobs Engineering personnel, has responsibility for management of contract changes. This role comprises one of the most important and high risk positions of the AMRP program, given the vast amounts of money that flow through it. Liberty found that the assigned people have strong credentials, suitable educational background, and considerable experience.

AMRP uses Field Order Authorizations ("FOAs") and Change Order Requests ("CORs"). The former occur first, when the need for a contract change becomes known. An estimated price is agreed upon, and work is approved by the Project Management Office. A defined delegation of authority structure exists. The Contract Manager evaluates the estimate on behalf of AMRP, perhaps with the assistance of construction subject matter experts. This Manager does not, however, have professional estimating support. Subsequently, the contract change becomes fully documented and incorporated into the contract in a Change Order.

Management fully documents changes, but the next level of oversight, management, and monitoring of the change order process is weak. Except for a single page in the Monthly Report,

which has questionable value, management prepares no summary level reports prepared on the topic of changes, conducts no reporting on the status of changes on a project or contract, and performs no analysis of overall change levels on the program as a whole.

The expenditure of the large sums involved require much more extensive oversight. AMRP work appears to proceed without even a basic reporting structure.

The December 2014 AMRP monthly project report includes a chart showing the amount of Change Order Requests approved in 2014. These requests totaled \$28.6 million. The report provides no information to put that amount into context. It has a small magnitude by comparison with the annual budget of several hundred million. What cannot be determined, however, is how it compares with the values of contracts whose work is underway. There is also no forecast of final end-of-contract costs. The next table summarizes change orders by year. Again, no reporting or analysis provides context for judging the significance of these amounts.

**Table M.2: AMRP Change Orders by Year**

2011	\$40,258,205
2012	\$29,612,279
2013	\$46,637,770
2014	\$28,587,122
Total	\$145,095,376

cc. Contractor Data

Peoples Gas, like most utilities, requires little data from its contractors. This approach protects contractors from disclosure of their internal costs, productivity, staffing levels, supervision ratios, cost and schedule assumptions, and other competitive information. Peoples Gas considers such information irrelevant to its management of the AMRP. Management takes the view that the contractor has an obligation to deliver in accordance with the contract and the price. That view oversimplifies the case. Change order experience shows that AMRP “fixed prices” are not really fixed. The contract prices, or at least the unit rates, are fixed from a narrow perspective. The large number of changes that have occurred, however, means that prices are not fixed from a practical perspective. AMRP management must assess the propriety of change requests. Doing so without data about the contractor’s starting plan, assumptions, or anything other than key performance determinants undercuts that ability.

Schedule delay issues in 2014 led to direction from AMRP management that contractors develop acceleration plans to recover. The lack of data available to AMRP management, however, inhibits the ability to know whether contractor staffing met planned levels in the first place. How Peoples Gas determines that the “new” plan indeed represents an increase suitable to the challenge is also unclear in the absence of baseline data.

These examples demonstrate why People Gas should require appropriate project control data (*e.g.*, internal costs, productivity, staffing levels, supervision ratios, cost and schedule assumptions, and other competitive parameters) to accompany contractor bids. Moreover, contracts should also require continuing reporting of such data. Utilities claim that contractors refuse to provide such

data, but Liberty's experience shows another pattern. Moreover, it would appear unlikely for contractors to walk away from a 20-year opportunity, just to preserve confidentiality.

dd. Contractor Evaluation

A structured evaluation process forms a central part of selecting and managing contractors. Management should disqualify (or at least penalize) poor performers and those making unreasonable demands in future bidding. On the other hand, the Company should favor contractors who demonstrate special attention to maintaining a partnership approach, in order to preserve their 20-year position. A formal contractor evaluation process should document performance, and assure its reflection in subsequent bid evaluations.

Management advised Liberty of the existence of such a process. Follow-up by Liberty, however, indicated that the Supply Chain group applied it to only one year (2011). Supply Chain notes that any such evaluations today would be the responsibility of the contract administrator; *i.e.*, program management.

After these initial discussions, program management apparently developed and implemented an evaluation process in 2014. The process features surveys of AMRP participants. They rate the contractor in a wide variety of categories. The Company provided five examples of such surveys. Lessons learned meetings occur subsequently with each contractor to review survey results. The Company's description of the process suggests that the purpose is more for improved performance from feedback to contractors, as opposed to use in future bid evaluations.

### 3. Conclusions

**M.1 The procurement process for AMRP materials functions at a level that supports program schedule and quality.**

Numerous organizations, including Supply Chain, Engineering, and Construction support the process. Liberty found no indication that any significant weaknesses exist.

**M.2 There may be opportunities for a more aggressive effort in seeking benefits associated with the size and duration of the AMRP's materials needs. (*Recommendation M.1*)**

Peoples Gas offered only "multi-year procurements" as a strategy to seize the benefits of scale that should be expected from the AMRP. It may be possible to pursue other avenues for such benefits as well.

**M.3 Procurement metrics support the availability of adequate material and equipment to support AMRP installation activities, but regular reporting of the available information does not take place. (*Recommendation M.2*)**

Information showing procurement order fulfillment indicates rates consistent with ensuring material and equipment availability at levels that support program work. A metric that gives insight into materials kept on hand longer than expected shows a fairly substantial amount, particularly in 2014. That metric highlights the need for regular reporting and analysis of both material equipment underages and overages.



**M.4 The large scope and long duration of the AMRP creates opportunities for contracting efficiencies, but it does not appear that Peoples Gas is pursuing such efficiencies. (Recommendation M.1)**

The AMRP seems to be taking a “typical” approach to contracting, and doing a reasonably good job in applying that approach. However, the AMRP is not typical and the Company’s approach to contracting should not be typical either. The AMRP produces opportunities to obtain favored treatment in light of the long-term benefits of the program to contractors. The Company’s failure to take advantage of such opportunities does not optimize program performance.

**M.5 The contract administration function, excluding change control, does not take a sufficiently broad view. (Recommendation M.2)**

Discussions with key personnel revealed a lack of awareness of the contracts they have responsibility to administer. The contract sections discussed were important and basic to contract management, but key personnel were not aware of them.

**M.6 Management oversight of contract change management is too narrow. (Recommendation M.3)**

AMRP management approved a total of \$145 million of change orders. Despite the magnitude of this amount, Liberty observed little in the way of reporting on the results of the management program. Management reports change order costs monthly, but do not address whether those amounts are good or bad, expected or unexpected.

**M.7 The Company’s analysis of contract changes provides insufficient insight into the quality of performance. (Recommendation M.4)**

Contract changes have proven very large, both on an absolute basis (\$145 million) and on a relative basis (152 percent). Management knows the general causes of such changes. Liberty did not find, however, analysis linking the changes to performance. Such analysis has importance in addressing potential areas of change, such as future contract terms and project estimates. Adding a routine level of suitable analysis is necessary to the effective management of contract change requests.

**M.8 Peoples Gas does not require contractors to provide information necessary to facilitate contract management of performance and analysis of changes. (Recommendation M.5)**

The view that risk lies with the contractor and that AMRP management therefore does not need contractor data misses an important opportunity. The magnitude of change orders makes clear that Peoples Gas bears substantial risk. Managing this risk makes it essential for the Company to understand the details behind bids. Tracking the same data later becomes essential for day-to-day management of AMRP projects. Sound project management monitors performance against a defined standard, which in this case is the contractor’s bid. It is not possible to manage performance without an understanding of the contractor’s initial assumptions. Management should be examining issues that include whether unit rates being achieved are consistent with the bid plan, whether staffing is consistent with the bid plan, whether quality goals are being met, and whether adequate supervision is being provided. Addressing important management and oversight issues must become a critical Peoples Gas responsibility. Doing so requires a change from the view that such issues represent contractor responsibilities.

**M.9 Peoples Gas has a process for ongoing evaluation of contractors, but there is no indication of its use in the bid evaluation process. (*Recommendation M.6*)**

It is important that Peoples Gas incorporate contractor performance into subsequent bid evaluations.

## **4. Recommendations**

**M.1 Peoples Gas should develop a formal strategy to ensure that the Company gets above-average terms and below-average pricing in view of the long-term opportunities afforded by the AMRP. (*Conclusion M.2*)**

The efficiencies that can be realized by vendors in the AMRP environment, plus their motivation to secure and sustain long-term business, means that Peoples Gas has an advantageous position when it comes to negotiating terms. The Company should exert more effort towards defining where opportunities to gain procurement benefits exist, revising the procurement strategy accordingly.

**M.2 Peoples Gas should regularly include in program monthly reports information showing procurement fulfillment and past due rates. (*Conclusion M.3*)**

The large increase in material held past reported due dates that occurred in 2014 highlights the value in reporting information that permits management to determine the degree to which procurement activities support program work without unduly advancing procurement orders.

**M.3 Peoples Gas should develop a formal strategy to ensure that the Company gets optimum terms and pricing in view of the long-term opportunities afforded to contractors by the AMRP. (*Conclusion M.4*)**

The efficiencies that contractors can realize in the AMRP environment, plus their motivation to secure and sustain long-term business, gives Peoples Gas substantial leverage in securing favorable contract terms. The Company should exert greater effort towards defining where opportunities to gain contract benefits exist, revising the procurement strategy accordingly. Peoples Gas should pursue partnering opportunities with proven contractors.

**M.4 Peoples Gas should determine those contract administration tasks that it considers required, and assure that the Project Management Office executes those tasks. (*Conclusion M.2*)**

AMRP management has not implemented important contract administration functions, as defined within standard contracts. The Company should review the contracts, decide which features warrant implementation, and then require the Project Management Office to implement them. The Company can remove from the standard contract features that it deems unnecessary.

**M.5 Peoples Gas should apply a program of enhanced management oversight to the contract change process. (*Conclusion M.3*)**

With the enormous dollar value of changes at issue, it is essential that the Company control, monitor, audit, and subject to the closest of management scrutiny the contract change process.

**M.6 The Project Management Office should implement enhanced analysis of its results in managing contract changes. (*Conclusion M.4*)**

It is not currently possible to draw performance conclusions on the contract change management program. The Project Management Office only publishes raw numbers; *i.e.*, the total cost of contract changes. The resulting lack of context precludes substantial management understanding of how the program is performing. Analysis of the changes, their cause, their value versus expectations, and, most of all, analysis of whether or not they could or should have been avoided, provide the essential information that the Project Management Office is not currently providing.

**M.7 The Supply Chain and Project Management organizations should require contractors to provide key data that supports their plans and bids. (*Conclusion M.5*)**

Required information should include:

- Clear descriptions of their assumptions
- Detailed resource plans (numbers and skills)
- Correlation of expenditures and labor hours to schedule
- Overtime and shiftwork plans
- Non-manual support (*e.g.*, supervision, controls, administration, quality, safety) planned
- Any other data that the team believes will help them manage the contractor and future claims.

**M.8 The Project Management Office should link the results of its contractor evaluation program to future bid evaluations and awards. (*Conclusion M.6*)**

The evaluation program is relatively new, just starting in 2014. In the future, its results should be applied to consideration of evaluated contractors for future bid awards.

## *Chapter N Table of Contents*

Chapter N: Executive Oversight .....	N-1
1. Background .....	N-1
2. Findings.....	N-1
a. Mission, Vision, and Strategic Plans .....	N-1
b. Senior Executive and Board Oversight Responsibilities .....	N-4
c. Capital Allocation, Constraints and Budgeting .....	N-5
d. Executive and Board Monitoring of AMRP Progress .....	N-8
3. Conclusions.....	N-12
4. Recommendations.....	N-15

## Chapter N: Executive Oversight

### 1. Background

This chapter:

- Describes how parent and utility mission, vision, and strategic plans address the AMRP
- Addresses the sufficiency of the allocation of capital to the AMRP
- Evaluates the AMRP oversight roles and responsibilities of executive management and the boards of directors
- Assesses how senior leadership and the boards monitor AMRP status and progress.

Developing and executing a sound management approach to the AMRP begins with the most senior leadership. This chapter addresses how senior leadership has acted to define the dimensions of the AMRP, supported its requirements through the dedication of sufficient financial resources, and remained engaged in overseeing performance against well-defined objectives and metrics.

The AMRP has depended on holding company-level resource allocation decisions, including funding and access to capital for the program. Funding constraints from the Integrys board of director or executive levels that affect capital resource allocation and prioritization could materially impair program efficiency and effectiveness. Top executives and the boards must ensure the application of adequate financial resources, based upon clear plans that senior leadership directs and oversees, and against which it continually measures.

Public safety comprises a paramount objective and customers must eventually bear the costs involved in securing it. Thus, customers and other stakeholders have a strong interest in remaining aware of plans and results. Keeping the Illinois Commerce Commission and stakeholders aware of how much risk, main replacements mitigate, how fast, and how expensively, have special importance for a program like the AMRP. The program will consume vast amounts of resources year over year for a long duration.

The existence of sufficient detail regarding milestones, schedules and expenditures, and the quality of estimates for spending in the capital budgets and long-term plans comprise important tools for supporting senior executive management and board oversight.

The boards should have approved the AMRP initially, receive regular updates, and continually oversee changes in dimensions of the program. The boards need to treat the program as a strategic initiative. It merits ongoing formal updates and status reports that provide measurements against key indicators.

### 2. Findings

#### a. Mission, Vision, and Strategic Plans

The AMRP has vast cost magnitude. Its primary goal - mitigation of safety threats - addresses operating risk (for both the public and the Company) of first-order magnitude. Program size presents significant financial risk. Successful AMRP management requires Peoples Gas to manage

regulatory and rate risks. One should expect considerable guidance, direction, and oversight from utility and parent executives and their boards of directors.

A prominent strategic plan and planning process that includes the AMRP has much importance in gaining the input and support of executive management and the boards. Strategic plans, which the industry generally revisits annually, represent the primary process for planning on a long-term (or strategic) basis. Key components of effective plans include strategic initiatives or major projects (such as AMRP) that will prove crucial to meeting financial and operating objectives.

*i. Integrys Mission and Vision*

Integrys developed vision, mission, values and expectations statements a number of years ago. The Company addresses them in internal communications as well as in the parent annual report. The vision statement provides simply, “*People creating a premier and growing energy company.*” Key phrases of the Integrys vision include:

- *People creating: Our ability to achieve the vision rests with our people, who are actively working to make the vision real.*
- *Premier and growing: We strive to be the best at what we do, both internally and externally, and are constantly changing to meet customer needs and expectations.*
- *Energy company: We are focused on the energy business in regulated and the nonregulated sectors.*

Integrys executives believe that the AMRP offers a “perfect fit” with a strategic focus to invest in utility infrastructure. In the years before AMRP initiation, the Integrys non-regulated energy trading business was a primary earnings driver. The business had reached 40 percent of Integrys net income, and was growing. However, the national financial crisis in 2008 and 2009 caused severe liquidity issues in energy trading. Integrys subsequently sold most of the trading business in 2010. Integrys then refocused its strategy to seek a portfolio of regulated utilities that would bring 90 percent or more of parent earnings from utility operations, and focus on internal growth.

Peoples Gas was then experiencing equity returns the parent considered poor. Programs like the AMRP would generate rate base growth. Ongoing operations were not otherwise forecasted to bring significant growth. Integrys viewed the AMRP as an opportunity to invest in a growing regulated rate base. AMRP-induced rate base growth could drive long-term earnings growth for Integrys. The investment in utility infrastructure also conformed closely to the Integrys vision and business model.

Executive leadership sees the Wisconsin Energy acquisition in similar terms. Statements by the acquirer confirm this observation. The AMRP provides an acquirer with the ability to invest more equity capital in utility operations. Wisconsin Energy, for example, has recently been buying back stock rather than investing in rate base growth.

*ii. Integrys Strategic Planning*

Strategic planning for Peoples Gas takes place at the Integrys level. The Integrys Strategic Planning Vice President manages and coordinates the process. The senior executive staff (of approximately 12 senior officers) collectively has responsibility for developing the plan. A small

strategic planning staff facilitates meetings that help drive the planning process. Each business unit head acts as a subject matter expert for topics in the areas of his or her responsibility.

The planning staff starts with a sequential list of activities to develop strategic plans. It includes:

- Analysis of the external industry environment
- Trend monitoring (*e.g.*, energy pricing, energy efficiency, renewable programs)
- Review of operating and financial performance by existing Company businesses
- Development of a “view for the future” supported by analysis of potential scenarios and possible outcomes
- Proposing strategic initiatives (*e.g.*, selling or buying businesses, developing new opportunities, changing the existing business lineup)
- Performing business plans for selected opportunities.

A Long Term Financial Plan acts as a “scorecard” for strategic planning. The underlying planning model produces a five-year plan that measures results of potential strategic moves. The model examines potential outcomes “with and without” initiatives. Scenarios performed using the Long Term Financial Plan serve as the foundation for strategic planning. The strategic planning process culminates in the presentation and discussion of the plan at the Integrys Board of Directors strategic retreat, which usually takes place in June of each year.

The key financial target for base scenario analysis is the production of targeted growth rates for Integrys over the long term. Capital expenditures for major programs, like the AMRP, are expected to meet the earnings per share target growth rate before inclusion in the strategic plan. Integrys also targets a total annual return to shareholders, including dividends and growth.

### *iii. Historical Strategic Plans*

Liberty reviewed the strategic plans presented at the Integrys board of director’s annual planning retreat for each year from 2010 through 2013. Integrys did not prepare a strategic plan in 2014. Management cited the Wisconsin Energy acquisition as the reason.

The 2010 strategic plan began with a brief definition of an Integrys “base strategy.” It included plans to invest in capital and infrastructure replacement, attain first quartile operating performance, and earn near the authorized utility returns on equity. The 2010 plan lists the Integrys “strategic objectives,” which included: increase rates of return and earnings per share growth, dispose of the energy trading business, develop management processes, achieve top quartile operations performance, and explore solar businesses and growth opportunities. The 2011 Integrys strategic plan identified eight “strategic initiatives,” which included the AMRP.

The 2012 strategic plan presented financial analyses comparing the previous year’s base case strategic plan to one year of actual results and to a new forecast. Results of the new five-year forecast fell significantly below those of the previous year. The strategic plan then looked at several scenarios that involved major changes to strategic direction, such as divestiture.

The 2013 strategic plan focused entirely on the utility businesses, with no discussion of non-regulated businesses. Some of the slides emphasized that Peoples Gas and North Shore gas are “perfect fits” for the Integrys strategy. The presentation focused on regulatory treatments and on

equity returns authorized and earned. Another major section of the 2013 strategic plan included a focus on major utility projects during the 2011 to 2015 period, including the AMRP project.

*iv. Integrys Strategic “Initiatives”*

The AMRP’s importance and size make it typical of programs that gain substantial attention at the highest levels. This attention makes such programs strategic, as opposed to operational initiatives. Such initiatives call for continuous monitoring at the highest level. The Integrys CEO presents to the board each December a strategic initiatives letter. Its initiatives define the most important priorities for goal setting and planning. The CEO’s letter treats them at a high-level and with a strategy orientation. The letters do not provide progress updates. Liberty reviewed the “key initiatives” letters issued since 2010. The key initiatives letters go to management and all employees to communicate the Company’s strategic direction in the upcoming year.

The list of 2011 strategic initiatives treated the AMRP as follows:

*Complete the planning phase of the project management process and begin the Accelerated Main Replacement Program in Chicago, ensuring safety objectives, schedule and budgets are met, and that stakeholders are informed*

The 2012 and 2013 letters included the AMRP among 8 to 10 key initiatives addressed.

The Integrys board and senior executives have receive updates addressing the strategic initiatives. For instance, a December 2013 update included the goal to “successfully execute rate cases and related proceedings to ensure timely and appropriate recovery of and return on our investments and to improve reliability and reduce risk associated with our regulated utilities.” This update specifically identified the AMRP.

A 2014 initiative stated the following with respect to major projects, which specifically included the AMRP among three others:

*Execute major projects consistent with project plans as well as safety, schedule, budget and operational performance targets.*

The Integrys strategic initiatives included the AMRP since at least 2010. Peoples Gas had previously been implementing a more slowly-paced main replacement program since the 1970s. Immediately following its acquisition of Peoples Gas in 2007, Integrys sought to accelerate the main replacement program. It also sought to secure a cost-recovery rider to make acceleration more financially appealing. Integrys first sought a recovery rider in its 2007 rate case.

**b. Senior Executive and Board Oversight Responsibilities**

*i. Integrys Board of Directors*

The Integrys board received a milestone presentation on the AMRP on February 10, 2011. The presentation provided the project summary and background. It also addressed program approach, 2011 deliverables, communication and customer experience plans, and current status. The same meeting brought before the board an “approval requested” document addressing an accelerated gas main replacement program and the major contracts requiring approval. A short background and description noted that, based on system conditions and Illinois Commerce Commission recommendations, Peoples Gas had developed an accelerated strategy to replace leak-prone pipe



over a 20-year period. The presentation set forth the expectation that the program would result in significantly increased capital expenditures for the next 20 years. The presentation offered an estimated total cost in 2010 dollars.

The approval request also specified planned 2011 capital expenditures, and provided a summary of capital requirements through 2030. The approval request also covered the award of major material, installation labor and other vendor contracts for 2011 work.

*ii. Executive Steering Committee*

An Executive Steering Committee provides the senior management forum for monitoring AMRP. The committee's establishment came early in AMRP program history. The committee has recently increased to almost 20 members, including six or seven senior executives. Some of the key committee leaders have been the Integrys COO, the Peoples Gas President, the Integrys CFO, the Integrys Controller and the Integrys Executive VP – Gas. This last executive has been the one most directly involved in the AMRP. The committee usually operated under a set agenda. Presentations and slide packages support all committee meetings.

Management has prepared quarterly AMRP presentations. Senior management reports that Peoples Gas board members, like other executives and managers, have open invitations to these presentations. Liberty found the quarterly AMRP presentations detailed. Each contains about 120 slides. Executive Steering Committee meetings follow these quarterly presentations. The Committee receives a shorter, executive-summary version of the presentations.

*iii. Peoples Gas Board*

The Peoples Gas board has also undertaken efforts to oversee the AMRP. Presentations came before the Peoples Gas board prior to program commencement, with regular project updates following in April, June, October and December in 2011, and in February 2012. Following this last presentation, the Peoples Gas board did not receive additional presentations specifically prepared for its consideration. Members of the Peoples Gas board have stated that, despite the absence of continuing formal presentations, the utility board has received updates from senior executives at quarterly meetings. The Peoples Gas board, unlike that of the parent, has no outsiders. Many Integrys senior executives sit on the utility board.

**c. Capital Allocation, Constraints and Budgeting**

High-level resource decisions, particularly those addressing funding and resource support, have central importance to AMRP success. Financial funding constraints imposed by boards or senior executive management would send a message that other things are more important, and that the program may not be high on the priority list. Such actions could have major consequence for a program with the AMRP's risks.

Full financial commitment by top executives and the Peoples Gas and Integrys boards is necessary for ensuring sufficient resource commitment. For instance, the allocation of capital resources elsewhere may direct funding away from the AMRP. How capital resources get allocated at the highest, parent board level is an important consideration affecting the AMRP.

*i. Capital Allocation*

Capital allocation for Peoples Gas and AMRP and for other Integrys subsidiaries occurs at the highest levels of Integrys. Allocation occurs first under proposed strategic plans and later under specific capital budget proposals presented to the Integrys board. The strategic plan typically presented to the Integrys board at its June strategic retreat includes the Long Term Financial Plan. This plan quantifies the projected outcome of strategies over the long-term, and includes specific capital spending for each subsidiary, including Peoples Gas.

The Integrys financial executives note that they plan for capital expenditures “consistent” with long-term earnings per share and credit metric targets. The planning process starts with requests from engineering and field operations, prepared early in each calendar year. The Company receives bottom-up input regarding the expectations for work and capital expenditures required to sustain utility service, for at least a five-year planning period. The input becomes an input to the Long Term Financial Plan model.

Integrys financial executives also note that the planning process generally does not constrain the operating utilities. Management cites as an exception the extreme case of the 2008/2009 national financial crisis. From an overall perspective, no substantial reason exists to restrain utility capital expenditures. Higher capital expenditures drive rate base growth, which, over time, supports earnings per share growth goals. However, Qualifying Infrastructure Plant Surcharge has an average annual limit of 4 percent of base rates. This limit has the potential for influencing Peoples Gas capital expenditure levels. Capital allocation from the Integrys level considers Peoples Gas needs broadly, not focusing solely on the AMRP.

The results of the Long Term Financial Plan modeling influence the development of net income and capital expenditure targets. The modeling undergoes Strategic Planning Committee review in March. After refinements, the Integrys board considers the plan at its June retreat.

Following board acceptance of the strategic plan and Long Term Financial Plan, the contents of the first two years set target levels for preparing budgets. The Integrys CEO sends a memo with net income and capital expenditure levels as budget targets. The CEO may adjust Long Term Financial Plan results upward or downward in setting budget targets. Capital expenditure budgets for two years then get developed from the bottom-up. Senior management review occurs and the Integrys board considers results at its December budget approval meeting.

AMRP capital spending fell significantly below budgeted levels in September through December 2012. A senior executive explained that Peoples Gas then managed capital expenditure spending on an “overall company,” rather than a program by program basis. Total spending for the year became too high relative to overall budget. Work other than the AMRP reportedly drove the overage. The Company slowed AMRP spending to bring total utility to budgeted levels. AMRP management reduced program spending by:

- Not awarding new projects
- Prohibiting contractors from starting new phases under existing awarded projects
- Directing contractors were to suspend work on existing phases
- Directing contractors to perform interim restoration where possible
- Suspending overtime for utility labor crews

- Suspend overtime for field inspectors
- Suspending non-essential work.

The cutbacks caused AMRP project delays that led to large carryovers of 2012 work into 2013. Recognizing the implications of such an approach for the AMRP, the Project Management Office of the AMRP was given responsibility for managing all Peoples Gas capital expenditures in 2013.

In the 2013 cycle, Peoples Gas capital expenditures in the Long Term Financial Plan increased significantly for future program years. Company executives explained that AMRP estimates were adjusted significantly upward for all future years in 2013, because:

- AMRP costs per mile were proving higher compared with experience
- City restoration and paving requirements had increased in every year of the project
- City permitting costs had increased significantly
- Peoples Gas changed directional digging procedures from those used through 2012.

2014 planning work produced a significant forecasted increase in Peoples Gas capital expenditures. Financial executives noted additions to capital forecasts starting in 2018, to pay for the replacement of additional “high consequence gas mains.” Management did not distribute this forecast immediately to executives and the boards. The proposed acquisition of Integrys by Wisconsin Energy led to a decision not to complete strategic planning in 2014. However, financial management reports that it alerted senior executive and the Integrys board that large expenditures loomed on the horizon.

#### *ii. ICR and Qualifying Infrastructure Plan Mechanisms*

Peoples Gas first proposed a cost recovery rider to help fund a long-term accelerated main replacement program in its 2007 rate case. The Commission’s rate case order included a “roadmap” of the details required for the Commission to consider a rider in the future. The Peoples Gas 2009 rate case filing used a forecasted test period. The Company provided more details and data regarding an accelerated main replacement and potential cost recovery. The ICC approved the “ICR Rider” for Peoples Gas in 2010. The ICR included a baseline amount of expenditures above which the rider would become effective.

The ICR Rider was overturned in September 2011. Management considered changing the pace of AMRP expenditures. The Company determined that traditional ratemaking processes would mitigate the regulatory lag accompanying the overturning of the ICR rider. Management reports that it decided to continue with AMRP work, for at least the next two years, pending approval of a recovery mechanism it would find satisfactory.

Efforts to secure such a mechanism proved successful. The resulting Qualifying Infrastructure Plant Surcharge covers the AMRP and pressure increase and meter relocation work. Accelerated recovery commenced in 2014, with a term of 10 years. The surcharge provides for a return on installed capital costs using the last authorized return on rate base. It includes a 4.0 percent cap, applied to base rate revenues, on cumulative average billings under the rider since the last rate case. A 5.5 percent annual maximum also applies.

The Director of Finance – Gas’ group works with the AMRP project managers annually to capture future expenditures for budgeting and for long-term financial planning. The AMRP operates under a five-year rolling plan. Annually, the Director of Finance - Gas communicates with the Treasury department to establish a proposed first-year target total capital expenditure number for Peoples Gas (it includes the AMRP budget) as part of the budgeting process.

*iii. Financing*

The ability to fund AMRP capital expenditures through external financing and equity could constrain progress. Integrys financial executives do not believe Peoples Gas has faced or will face risk due to limitations on outside financing, provided that the Company’s credit profile remains strong. The public and private debt markets have a large appetite for high-quality utility bonds. For instance, Peoples Gas recently priced and sold \$200 million of long-term debt.

Capital expenditure levels require external financings by Peoples Gas nearly annually. Financial management forecasts long-term debt issuances in three of the next four years. Over this period, equity funding will come from internal cash flow and retained earnings. Peoples Gas has halted dividends to the parent. Integrys forecasts that equity sufficient for the holding and operating companies will remain sufficient at least through 2016. A currently inactive dividend reinvestment plan could resume if needed to secure equity capital not now seen as needed.

Liberty questioned whether significantly increased capital expenditure requirements could cause financing difficulties. Management observed that current capital expenditure levels of \$300 million per year present no significant financing challenges. They anticipate that Peoples Gas could accommodate a reasonably-substantial increase if credit ratings remain strong. Management does, however, cite AMRP cost recovery problems as a potential financing limitation. Should AMRP expenditures exceed the Qualifying Infrastructure Plan’s recovery limits, a small increase in financing might result, but management does not believe it likely to impose a material constraint on securing financing at desirable rates.

*iv. Capital Expenditure Budgeting*

The Long Term Financial Plan has comprised part of the strategic plan presented to the Integrys board at its annual June retreat. That did not happen with suspension of planning activities in 2014, however. With this exception, the capital budgeting model has opened in June for capital expenditure inputs entered by the business units. Managers in the gas business provide capital expenditures estimates using a bottom-up consideration of work plans. They provide a basis for management’s preparation of early capital budget information. The capital budgeting process otherwise has used the first two years of the Long Term Financial Plan to set targets for capital budgeting work. The model is closed for inputs in September. The next step is for managers to refine and summarize the capital budget for presentation to Integrys executives. Following approval by the holding company executives in October, further capital budget refinements and explanations continue, in anticipation of holding company board approval in December.

**d. Executive and Board Monitoring of AMRP Progress**

Members of the Executive Steering Committee and of the two boards (Integrys and Peoples Gas) need regular updates and progress reports that allow them to oversee and monitor the AMRP on a

real-time basis and at a sufficiently comprehensive and detailed level. The quality and accuracy of all reports and updates at each level above program management should be commensurate with their responsibilities. Such reports should clearly communicate achievement (or failure) on key performance indicators and other project metrics. Such indicators and metrics need to measure progress against approved work plans and budgets, and against the long-term goals and milestones required to meet the 20-year commitment.

*i. AMRP Monitoring by the Executive Steering Committee*

The Executive Steering Committee has primary responsibility (above the program management level) for executive monitoring of the AMRP. The Committee members in 2011 included the Integrys Chief Operating Officer (“COO”), the People’s Gas President, the Vice President of Gas, the Integrys CFO, the Integrys Controller, the AMRP project manager, and two others. Committee members state that regular meetings occur on a quarterly (and sometimes a more frequent) basis. However, Company records document meetings on a far less frequent basis (two to three times per year), following the initial December 2010 meeting:

- 2011: May and October
- 2012: July and October
- 2013: April, August and October
- 2014: February and July (through October).

Documented presentations accompanied each of these Committee meetings. The May 2011 presentation, coming shortly after AMRP commencement, was relatively brief. It noted main and service installations and retirements planned for 2011. Procurement of contractors was to be accomplished through three rounds of “bid letting RFP” processes. The presentation identified project locations for the work contracted through the bid processes, with the number of sub-projects, miles installed and miles retired identified for each package.

The October 2011 presentation addressed Rider ICR status, 2011 project statistics, 2011 project status, a financial forecast, safety performance, project challenges, and the 2012 plan and schedule. The presentation noted that, as of early October, progress appeared well behind plan.

The 66-page July 2012 presentation, titled “Program Update Quarterly Meeting,” had content identical to a contemporaneous presentation to the Peoples Gas board. The topics included safety performance, quality performance, budgets for 2012 and 2013, 2013 engineering projects, construction planning information, a construction contractor update, and a gas operations construction update. The categories covered in the presentation remained consistent from this presentation through the 2013 presentations, with special topics and focuses addressed in each.

The three Executive Steering Committee presentations in 2013 focused on safety performance, construction progress, budgets and budget forecasts, and special items. These items included the 2013 scope of work, new initiatives, Chicago Department of Transportation issues, information technology support needs, 2014 construction improvements, 2014 challenges, AMRP Project Management Office resources and Qualifying Infrastructure Plant Surcharge compliance.

The 2014 presentations in February and July included an increased focus on progress in construction and performance measures. The 2014 presentations also added descriptions of the

initiatives (such as those resulting from PwC efforts) designed to improve program performance, and discussed filings seeking a rate recovery mechanism. In addition, the July presentation discussed a resource and recovery plan.

Work by an outside firm (PwC) in January 2011 noted the establishment of the Executive Steering Committee, but observed the lack of a charter and reporting, and concluded that its involvement had not been optimized. The firm recommended development of a charter, notice of program risks and issues associated with key performance metrics, and engagement in assessing AMRP organizational readiness. The documents that would implement this recommendation have not been developed. Neither did Liberty's review of Committee activities demonstrate broad engagement on performance and organizational matters.

## *ii. Peoples Gas Quarterly Board Presentations*

Typical in utility holding company structures, the Peoples Gas board consists of internal executives or managers. Outside membership dominates at the Integrys level. The Peoples Gas board received five AMRP update presentations through February 2012. These very general project updates took an operational focus, addressing the formal capital approvals required from the utility and parent boards, and discussing high-level project goals, risks, and progress made in 2011. The utility board has not received any AMRP presentations since February 2012, for the cited reason that they had become too voluminous.

Around this time, a program of Quarterly AMRP meetings (supported by presentations) began. The presentations typically involved more than 100 employees, many of them executives. These presentations generally included more than 100 slides. They contained more detail than those provided to the Executive Steering Committee. Those Executive Committee meetings that have occurred began immediately after these larger sessions. Top management considers the quarterly meetings and the occasional Executive Committee sessions sufficient to all executives, including Peoples Gas directors, sufficiently informed.

The following table lists "AMRP update presentations made to the Peoples Gas board and the much more broadly attended quarterly session July 2014."

**Table N.1: Regular AMRP Updates Since 2011**

<b>Update</b>	<b>Date</b>	<b>Update</b>	<b>Date</b>
Utility Board Update	1/10/2011	Quarterly Presentation	7/31/2012
Utility Board Update	4/25/2011	Quarterly Presentation	10/23/2012
Utility Board Update	6/30/2011	Quarterly Presentation	4/30/2013
Utility Board Update	10/24/2011	Operations Update	6/6/2013
Quarterly Presentation	12/13/2011	Quarterly Presentation	8/1/2013
Utility Board Update	2/13/2012	Quarterly Presentation	2/18/2014
Quarterly Presentation	2/28/2012	Quarterly Presentation	7/30/2014
Quarterly Presentation	4/18/2012		


### iii. Integrys Board Monitoring

The Executive Vice President – Gas made the first AMRP presentation to the Integrys board in December 2010. Since that time, the Integrys board has received a steady stream of high-level AMRP information and project updates. The information has regularly included:

- Integrys Key Initiatives, 2010 – 2014: The Integrys CEO lists 8 to 10 “Key Strategic Initiatives” each December for the board, senior executives and employees, to provide direction and focus for the upcoming year.
- Capital Approvals, 2010 – 2014: The Integrys board reviews and approves capital approval requests annually. The AMRP requests include short project backgrounds and descriptions, a cost and recovery summary, and the requested approval amount.
- Integrys Strategic Plans, 2010 – 2013: The Integrys board review of the strategic plan at its annual summer retreat includes the AMRP as a strategic initiative.
- Strategic Initiatives Updates, 2011 – 2014: “Strategic Initiatives” scorecards summarize AMRP performance on safety, budgets, and miles of main retired. These scorecards came before the board monthly in 2011, quarterly in 2012, only at the end of the year in 2013. A quarterly approach resumed in 2014. The next figure provides an example of these one-page summaries.
- Status Report on Major Projects (at each board meeting): The Integrys board receives at each meeting a scorecard (shown in the next figure) on major projects.

No supporting information accompanies this summary level depiction that the figure provides.

**Figure N.2: Example of Integrys Board Scorecards**

Measure	2013	Previous Quarter	Current Quarter-Q2	Target	Trend
AMRP		<div>● Safety</div> <div>● Budget</div> <div>● Retirements</div>	<div>● Safety</div> <div>● Budget</div> <div>● Retirements</div>		

Reporting at top levels has not provided consistent messages. For example, the AMRP monthly report for June 2014 showed an AMRP management self-rating for the month of June as “green” for safety and as “red” for both budget and retirements. The monthly report indicators for budget and retirements indicate spending well below planned levels. Progress curves showed miles of mains retired, services installed and blocks of restoration all well below plan. The Executive Steering Committee report for July 30, 2014 reported on construction status as of the week of July 18, 2014. Listings of miles of main retired and numbers of services installed showed both to lie well below planned, year-end amounts.

Utility board minutes did not mention AMRP performance for 2014 meetings through July. An August 14, 2014 report on major projects to the Integrys board updated AMRP progress through June 15, 2014. This report rated the AMRP as green on both “project budget status” and on an “overall status.” The status report included short explanatory text for the performance ratings:

*Budget status is Green, however, spending is tracking well below plan and is not supportive of recovery under the QIP (recovery mechanism). Estimates on investment recovery are still being developed, but projections indicate costs recoverable under QIP will be below original estimates. Overall project status is Green, but retirement of old main is lagging*

*behind planned retirements... Main retirements are tracking behind plan, as are services (58%) and meter (48%) installations.*

### **3. Conclusions**

#### **N.1 The AMRP has been given appropriate and prominent corporate priority and commitment in strategic plans and initiatives.**

The AMRP properly aligns with the Integrys vision, missions, and strategies. The strategic plan and the planning process place sufficient focus on the AMRP. Strategic plans undergo reassessment annually, and represent the primary process for Company planning and commitments on a long-term basis. Key components of strategic plans include strategic initiatives or major projects, such as AMRP.

Liberty reviewed strategic plans presented at the Integrys board's annual planning retreat since 2010. The AMRP project has comprised a major strategic initiative for Integrys since at least 2010. Top management and the Integrys board have appropriately established the AMRP as a prominent corporate priority and commitment in the Integrys strategic plans and initiatives.

#### **N.2 Peoples Gas has not faced holding company constraints on financial resource allocations to fund capital expenditures.**

The AMRP depends upon holding company resource allocation decisions, including funding and access to capital. Funding constraints from the Integrys board or executive levels regarding capital resource allocation and prioritization could materially affect the program, but this has not been the case. Executives and the boards have supported the application of adequate financial resources based upon clear strategic plans that include the allocation of financial resources. The budgeting process sufficiently links to strategic plans, and supports the implementation of AMRP and progress toward meeting the project's goals, objectives and schedules.

This conclusion does not address tactical decisions, such as rate recovery limitations, but rather more strategic capital access and allocation issues among Integrys businesses. AMRP cost planning appears driven by conformity to a budget that ensures expenditures that approach but do not exceed limits on accelerated recovery under the Qualifying Infrastructure Plant Surcharge. Even under that driver, AMRP management has had difficulty in meeting planned expenditure targets through the program's early history. This report's chapters G: Cost Planning and L: Cost Management address accelerated rate recovery and AMRP spending further.

#### **N.3 Integrys does not anticipate constrained funding or external financing for AMRP, even should increased capital expenditure spending become required.**

The ability of Peoples Gas and Integrys to fund AMRP capital expenditures through external financing sources and equity capital has the potential for constraining AMRP progress. However, Liberty observed no substantial risk that parent or utility financial circumstances will cause that impact. Historically, Peoples Gas has not been constrained in raising debt or equity capital to finance major capital expenditures, with the exception of a few weeks during the extreme case of the 2008/2009 national financial crisis.



Ample sources of investment for debt capital exist for utilities, such as Peoples Gas, that have strong credit ratings. Credit ratings determine financeability and debt pricing for Peoples Gas. The current “A” rating for Peoples Gas bonds is sufficiently strong to effectively attract low-cost debt financing at reasonable costs.

Liberty also sought to determine if any large increases in capital spending for AMRP might impose significant financing constraints. Liberty found reasonable the opinions of Integrys financial executives that continuation of a strong credit profile would sustain significantly increased expenditures without creating material financing constraints or impacts.

**N.4 The governance roles of the Executive Steering Committee and the Peoples Gas board for AMRP oversight, monitoring and decision authority remain weakly defined. (Recommendation N.1)**

Senior Integrys leadership views the Executive Steering Committee as the primary vehicle for top-level oversight of the AMRP. The lack of defined governance for the Committee has persisted since project inception in 2011. Liberty found no Executive Steering Committee charter. Top Integrys management acknowledges that management and controls have substantially lagged dollars spent and work performed in the field. The Committee’s role and authority remain unclear.

Defining and structuring AMRP governance remains a substantial weakness. Executive ownership (outside the very large Executive Steering Committee) has not been clearly assigned. The mission, roles, and responsibilities of the senior oversight function have not been clearly defined or articulated. Clear accountability for AMRP performance at senior executive levels has not been clearly identified.

**N.5 Oversight through the Executive Steering Committee has been intermittent and lacking in clear follow-through and corrective actions to address performance shortfalls. (Recommendation N.2)**

Key attributes of effective oversight include: (a) frequent meetings and discussion, (b) regular reporting schedules, (c) key performance metrics focusing on progress against plan, (d) project reporting with “insightful analysis,” (e) executive summaries of analysis for upward board reporting, and (f) documented meetings and decisions with agenda/minutes/reports.

Despite reports of quarterly meeting cycles, Liberty found that Executive Steering Committee meetings occurred on a significantly less frequent basis. Even meetings as infrequently as quarterly would be hard to square with the needs and magnitude of the AMRP. The frequency of meetings does not support the focused oversight and monitoring required.

Moreover, a review of the Committee’s efforts does not demonstrate an aggressive level of engagement in identifying and addressing AMRP performance issues. The Committee has not documented meetings and decisions with agendas/minutes/reports. Liberty did observe attention by the Executive Steering Committee and the Peoples Gas board to remain informed about the program. Liberty could not, however, identify a structured and well-defined set of oversight, monitoring and decision authority guidelines, information requirements, and points of control.

**N.6 There has not been sufficiently active board of director oversight and monitoring of the AMRP. (*Recommendation N.3*)**

The utility board of directors nominally approves capital expenditure budgets, financings, and major contracts. As is typical of holding company structures, however, it does so through a board consisting of inside (employee) executive and management leadership, with no representation from outsiders. AMRP update presentations came before the Peoples Gas board only rarely and they ceased after February 2012. These presentations focused on the formal approvals required as a matter of law, and not on program performance metrics. Thus, the utility board cannot be said to have operated as a source of close performance oversight, even when it was receiving occasional AMRP presentations. Liberty's review of utility board minutes found mention of the AMRP on only four occasions, with the last being in September 2012.

Independent oversight of management performance in the typical holding company structure, as is the case for Integrys/Peoples Gas, comes from a parent board comprised predominantly of outsiders. It is neither surprising nor troubling to find utility subsidiary boards operating through internal executives and focusing on legal and pro forma governance requirements. That said, however, it becomes important to examine the parent board's AMRP oversight role and performance, given that we did not find robust AMRP oversight at the utility board level.

Communication AMRP project performance to the Integrys board has produced an overly positive view. Discussions with a director, for example, elicited the view of a program very well executed and managed. This report found, the Company's own consultant has observed, and executive management (we believe) acknowledges many important gaps in program management, control, and oversight. Management's current acknowledgement is constructive, but demonstrates the variance between director perception and performance under the AMRP. The gap between actual program status and the picture presented to directors shows significant communications failure, whether it arises from a lack of management awareness, a lack of clear board expression of the need for better information, or some other cause.

Liberty examined reporting at various levels to determine the consistency of information received at each. This review disclosed inconsistencies as program data moved "upward." Liberty found instances where reporting on the project to the Integrys board appeared different and more positive than the monthly reports at the program and project management level.

**N.7 Top-level AMRP performance metrics and reports have not emphasized or clearly reflected performance against plans and budgets. (*Recommendation N.4*)**

Liberty found a lack of sufficient scope and detail in the AMRP performance metrics and reports to the Executive Steering Committee and to the boards. In particular, reports have lacked detailed information about program planned versus actual progress, insights into the causes of variances, and descriptions of responsive action plans.

Such reports should clearly communicate achievement (or failure) against key performance indicators and other metrics that measure progress against approved work plans, budgets, schedules, and other measures (such as work quality and safety). Measurements should track progress against short-term (*e.g.*, annual) targets, as well as progress against long-term goals and milestones required to meet the 20-year commitment.

AMRP performance metrics and reports to the Executive Steering Committee and the boards should emphasize and clearly reflect project progress and performance to plan/budget. However, performance metrics at the Executive Steering Committee level or higher up have not robustly considered progress versus budget or work plan. According to Company executives, they were unsure as to “how solid the AMRP plan was,” and avoided hard comparisons of actuals versus the plan, especially in the first year of the project.

Monthly reports provide program management with its principal regular documentation of AMRP progress. By the time progress information reaches the Executive Steering Committee through reports and updates that it receives, however, a more favorable view of program progress and status emerges. The same is true of information that comes before the Integrys board of directors. Use of a consistent set of measures for cost efficiency and effectiveness to keep people informed all the way up the management hierarchy was not apparent.

**N.8 Measurements of annual or cumulative progress versus the long-term plan goals and metrics have not been performed for the Executive Steering Committee or the Peoples Gas or Integrys boards. (*Recommendation N.5*)**

Key attributes of effective AMRP oversight include identification and regular use of key performance metrics to focus on progress versus plans. Liberty did not observe such measurements in reporting to the Executive Steering Committee or the boards of directors. The AMRP original 20-year plan has not been updated recently. Without a clear, comprehensive, and regularly updated 20-year plan, senior executive and board of director oversight cannot exist at a sufficiently meaningful level. The AMRP requires clearly established and communicated 20-year goals, capital spending and key progress metrics. Measurements of annual and cumulative project progress against the plan may then be regularly reported to the Executive Steering Committee and Peoples Gas and Integrys boards.

## **4. Recommendations**

**N.1 Peoples Gas should clearly define and document the AMRP governance roles of the Executive Steering Committee with mission statements, charters, and roles and responsibilities for project oversight, monitoring and decision authority. (*Conclusion N.4*)**

Liberty found that lack of definition and corresponding lack of structure in providing AMRP oversight at the corporate leadership level have persisted since program inception. Peoples Gas has acknowledged the need for developing a formal structure for AMRP governance and oversight. Following discussions with Liberty, beginning in September 2014, the Company identified plans to address oversight issues.

Liberty found the Company’s stated commitment to greater structure of the oversight function and its relationship to AMRP leadership appropriate as a first step. That commitment, however, needs to distinguish itself from previous oversight methods, in order to prove more effective. The proposed new group of oversight participants remains very broad and not fully independent of AMRP management. Identifying “executive overseers” as the entire Executive Steering Committee and the board of directors makes from 25 to 30 individuals responsible for oversight.

A number of these individuals are not senior executives. Including the Integrys Executive Vice President – Gas and some other proposed Executive Steering Committee members also does not meet the standard of “independence” as defined in the Peoples Gas criteria.

Liberty believes that concentrating the senior executive level oversight function to a group of perhaps three executives is appropriate. Use of the Executive Steering Committee as an organ for keeping a broad group of executives and senior managers aware of the current status of a program as important as the AMRP continues to be appropriate. Inviting comment and suggestion from the group as part of that process is also sound. The concern about making such a group responsible for a clearly defined oversight function, however, is a tendency toward diffusion of accountability. That diffusion will tend inevitably to reduce detailed information toward a lower common denominator. Keeping the oversight group very small and at the highest levels will better support clarity of role, detail of oversight provided, and accountability for using information to identify improvement opportunities.

In any event, clarity of membership, responsibilities, regular reporting and meeting requirements, and expectations for the group should be included in the mission statement, charter and oversight roles and responsibilities documentation that the Company states it is committed to developing. Peoples Gas has stated to Liberty that it plans to complete documentation addressing AMRP mission, roles and responsibilities of top-level program oversight.

The initiatives as described are positive, but the definition of mission, charter, roles and responsibilities, and decision authority for project executive oversight must be completed and implemented with dispatch, and with the refinements expressed above.

## **N.2 Peoples Gas should promptly execute its current plans to provide for more regular and effective oversight of AMRP and for follow-through and corrective actions to address performance shortfalls. (*Conclusion N.5*)**

The Executive Steering Committee has not met on a regular and frequent basis. The action plans that Peoples Gas has shared with Liberty call for a redefinition of executive oversight of the AMRP, specifically increasing scheduled review meetings and corrective actions to address performance shortfalls and adverse trends.

The improvement initiatives proposed by Peoples Gas address AMRP executive oversight frequency, engagement and corrective actions. However, turning these statements of intent and general description of goals into an effective oversight function “on the ground” will take significant change, not only in structure and documented practices and procedures, but also in culture, attitude, and focus. Selling this new approach, particularly through engagement by and instigation from the boards and top executive management, will be particularly important. Liberty anticipates the need for a transition period that requires a fundamental shift in perception about how top leadership can and should act to keep the AMRP on track as it progresses through what remains a long duration. In particular, significant top-level impetus must apply to reinforcing the message that senior leadership needs to remain engaged in holding program management accountable for performance against much more than meeting expenditure targets. Specifically, leadership should demand that management make performance levels, trends, and problems

transparent and meaningful at top levels, regularly engaging with management about those trends and problems, and ensuring that corrective actions get identified and executed promptly.

**N.3 Peoples Gas should substantially enhance the completeness and accuracy of AMRP performance information provided to the boards of directors, and ensure its consistency with information used by AMRP program management and provided to the small executive group with designated responsibility for program oversight. (Conclusion N.6)**

Independent oversight of management performance for AMRP has come principally from the Integrys board, where Liberty found reporting and views more positive than warranted. Reporting on the project to the Integrys board was different from and more positive than the monthly reports at the AMRP management level.

Executive management has acknowledged important gaps in program management and control, and, as discussed in the preceding conclusions, created action plans for addressing them. Those plans, however, do not explicitly address improvement in the accuracy and consistency of project performance information at the board levels. The degree of disconnect in past reporting makes it appropriate for Company plans to identify specifically how consistency will be maintained. Reporting on a program like the AMRP must take place at many levels. It extends as far down as supervision of direct work, and all the way up to the board of director level.

Such reporting obviously should “roll up” in level of detail as one moves upward in the supervision/management/executive/director hierarchy. Supervisors in the field need to measure performance often at the crew level or across durations as short as a day, or even a shift. Information “depth” is thus paramount. Moreover, while their need for detail is extensive in their areas of responsibility, they may have little or no concern even for summary level information in other functional areas (information “breadth”). However, at higher levels in the hierarchy, the need for depth decreases as the need for breadth increases.

The difference in needs, however, does not mean that different sources for information or judgments about its significance should apply. To the contrary, the best run programs promote consistency in information reporting as it rolls up or down the hierarchy. Use of consistent sources of data and engagement by an experienced source of cost management resources form important elements in ensuring that data underpinnings remain consistent and accurate as data information flows through that hierarchy. Similarly, a suitably empowered and located cost management organization has substantial importance in ensuring that analysis of and judgments about performance data remain objective and transparent, particularly at higher levels. This report’s Chapter L: Cost Management discusses the importance of the empowerment aspect of the cost management function. For purposes of this chapter addressing oversight, the critical feature to consider is the need to address explicitly how information accuracy, summarization level, and objective, candid, and complete analysis will be maintained in order to support oversight needs.

**N.4 Peoples Gas should expand top-level AMRP performance metrics and reports to include more actionable information, and to compare actual performance with plans and budgets meaningfully. (Conclusion N.7)**

Liberty found a lack of sufficient scope and detail in the AMRP performance metrics and reports to the Executive Steering Committee and to the boards. Reporting lacked detailed information about program planned versus actual progress, insights into the causes of variances, and descriptions of responsive action plans. Reports should clearly communicate achievement (or misses) of key performance indicators and metrics that measure progress against annual, approved work plans, budgets and schedules. The degree to which project management and senior executives are held accountable for project performance is crucial and important.

Regular reports should also compare a well-defined set of metrics to budget and plan on every occasion. Such metrics should address progress against approved work plans, budgets, schedules, and other measures (such as work quality and safety). Measurements should track progress against short-term (*e.g.*, annual) targets, as well as progress against long-term goals and milestones required to meet the 20-year commitment. Liberty also recommends that measures be developed for reporting cost efficiency in an informative manner (*e.g.*, cost per mile installed or retired, cost per service).

The initiatives that Peoples Gas has developed since discussions with Liberty began in September 2014 address needs that Liberty has observed. The Company's outline of planned actions address generally the need for changes in the nature and use of top-level metrics and reports, demonstrating understanding of and acceptance by Peoples Gas of the gaps that need to be addressed. However, it remains for the Company to turn this outline into a well-defined, complete set of measures, clear responsibility for accumulating and using the information to report them, measures to ensure their accuracy, plans to make them regularly available, and, most importantly, process for using them to identify performance issues and respond to them.

**N.5 Peoples Gas should upgrade AMRP performance metrics to include annual or cumulative progress versus the long-term (20-year) plan goals and metrics for the executive oversight group and the boards. (Conclusion N.8)**

The preceding recommendation addressed immediate-term plans and budgets. Effective oversight of the AMRP also requires focus on how progress conforms to longer-term expectations. Over a long period, factors unique to a given year (early in the ramp up period, or extreme weather, for example) may diminish the "predictive" nature of experience over the past 12 months or so. Liberty did not find material longer-term reporting or analysis at the Executive Steering Committee or board levels. Moreover, as addressed elsewhere in this report, the original 20-year plan had not been recently updated. Peoples Gas needs to clearly establish and communicate 20-year goals, capital spending and key progress metrics, and to measure annual and cumulative project progress against the plan in regular reports to the executive oversight group and to the boards. Reporting also needs to consider effectiveness in meeting the AMRP's overriding safety goal. How fast leak rates are falling and how much risk mitigation is occurring need to be addressed.

The discussions that began between Liberty and the Company in September 2014 have led to Company proposed improvement plans that recognize the need for long-term, as well as short-term key performance indicators, and for the need to analyze performance across durations longer

than the current budget year. As is the case with Company plans to address measurement and reporting against annual targets, however, what are now fairly general statements of intent need to be translated (as the preceding recommendations observe with respect to annual measurement and reporting) into a well-defined, complete set of measures, clear responsibility for accumulating and using the information to report them, measures to ensure their accuracy, plans to make them regularly available, and, most importantly, process for using them to identify performance issues and respond to them.

**N.6 Peoples Gas should employ outside assistance in designing and implementing the initiatives it committed to undertaking to improve AMRP management, control, and oversight. (Supported generally by conclusions throughout this report)**

The discussions that began in September 2014 between Liberty and senior leadership of Integrys and Peoples Gas led to Company commitments to make a broad range of improvements in AMRP management, control, and oversight. This chapter addresses a number of those initiatives; *i.e.*, those associated with executive oversight. As this chapter makes clear, the initiatives associated with improving such oversight concern a number of improvements that must take place at the AMRP program and project management levels. Other chapters of this report detail those lower level but still critical changes.

Moreover, a number of the initiatives concern areas identified by consultants to the Company as warranting improvement. Some of those consultant recommendations remain to be implemented, years following their appearance. The breadth and depth of the changes to which the Company has committed are extremely large. They will also be planned and executed under a Peoples Gas executive structure that has undergone fundamental reorganization. Perhaps even more significantly, the future of a new utility team is uncertain, given the pendency of a change in control request. Care must be taken to ensure that continuation of the change process does not get unnecessarily disrupted by changes that may come under potentially new ownership.

These factors combine to indicate the need for substantial outside assistance in planning and implementing the changes required. Such assistance will also provide senior leadership with an important source of validating the pace and effectiveness of changes. The AMRP management, control, and oversight changes in and of themselves comprise a major program. History and the scope and depth of required changes make it sound to seek such outside support in organizing, facilitating, and measuring the change processes and the schedule for executing them.

## *Chapter O Table of Contents*

Chapter O: Reports and Analysis and Controls Skills .....	O-1
1. Background .....	O-1
2. Findings.....	O-1
a. Reports and Analysis.....	O-1
b. Controls Skills.....	O-4
3. Conclusions.....	O-5
4. Recommendations.....	O-6



## Chapter O: Reports and Analysis and Controls Skills

### 1. Background

This chapter:

- Examines the reporting used to monitor AMRP progress against defined standards and targets
- Evaluates the sufficiency of analysis of reported information to support the optimization of AMRP performance
- Assesses the organization and resources engaged to provide such reporting and perform such analysis
- Addresses the capabilities of personnel in the program and project controls functions to meet AMRP needs.

A program such as the AMRP requires controls personnel with a high level of analytical skill. Management at all levels needs help in the analysis and facilitation of corrective action. A professional controls staff best serves this need. A program of the size and duration of the AMRP justifies investment in developing resources able to meet the need.

Discussions of management tools generally begin with “reports.” They represent the one tool that large projects rarely lack. Unfortunately, the industry has a tendency toward project reports long on data but short on analysis, and lacking the value that such analysis adds. Reports with a strong analytical component differ, however. When they identify performance issues and their causes, together with potential corrective measures, they offer substantial value in optimizing performance, especially for long duration programs like the AMRP.

Liberty applies a number of standards by which it evaluates the effectiveness of project reports. This chapter and Chapter V: Monitoring discuss them.

### 2. Findings

#### a. Reports and Analysis

##### *i. Overview*

Liberty has not found a sufficient level of reporting. More fundamentally, program management and those responsible for program oversight have not made effective use of performance results to drive improvement actions. This gap exists from the board of directors and executive management down to day-to-day supervision. Reports exist, but preparing them only starts to fulfill the need; using them as an instigator of corrective action gives them their principal usefulness.

Discussions that Liberty began with senior leadership of Integrys and Peoples Gas last September identified the need for a review of current reporting. That review needs to follow the guiding principle that the value of a report intended for management or oversight purposes is proportional to the degree to which it facilitates action on the part of the reader. Reports tend most often to fail because those involved too frequently explain away deviations with pat answers (*e.g.*, spending lags behind the plan because of delayed invoices; construction lags behind schedule because of the

bad winter, the project exceeded budget because of a bad estimate rather than weak performance). Such over-used explanations frequently obscure, rather than explain the real reasons; *i.e.*, the root causes. Performance measures only have real merit when analysis transforms them into meaningful performance insights. A chart (or the underlying data) does not communicate much until researching and interpretation what exists behind the obvious allows for informed judgments about root causes.

Effective monitoring has the following characteristics: importance-focus (zeroing in on critical or significant areas), insightful analysis (what drives variances), action orientation (what can be done better), and accountability (who must take corrective action, when, and how).

Chapter V: Monitoring provides a more detailed discussion of the foundation for Liberty's general reporting standards. Beginning from those more general standards, this portion of the report focuses on reporting that serves owner program management and oversight.

### *ii. Standards of Performance*

Effective analysis of performance requires clear benchmarks or metrics against which to measure. Some kind of plan generally establishes the basis for the work and the expectations for its performance. Such guidance finds expression in a high-level plan, a budget, a schedule, quality targets, safety indices, or similar assumptions made at some point during program or project planning. A very longstanding approach to project management compares actual performance against these previously established standards, analyzes deviations from those standards, identifies appropriate corrective action, reflects those actions in a revised plan as appropriate, and provides for measurement of those actions in correcting the problems that led to their adoption.

This long-standing approach has a much greater likelihood of failure when applied to large, complex projects and programs. Programs like the AMRP magnify the circumstances under which this traditional reporting approach often breaks down. Effectively holding people accountable requires a standard that is reasonable, credible, and given high priority. A common problem lies in the failure of original plans, budgets, or schedules to have substantial credibility. Where credibility is lacking, hard-hitting testing of performance shortfalls by management has difficulty in getting past out-of-the-box assertions, like "the estimate was bad," for example.

Thus, management must exercise vigilance in ensuring the credibility of plans, budgets, and schedules. Second, management must instill and enforce a philosophy that an "estimate is bad" type of conclusion will gain acceptance only after proper examination tests the contribution of all possible causes.

The AMRP's early history did not comport with a number of the standards that apply. The necessary baselines (plans, budgets, estimates, and schedules, for example) frequently did not exist. Where they did, they have tended to lack sufficient credibility to serve as meaningful standards. Program quantities and expectations for performance are not clearly defined. There is no schedule to lay out the 20 years of required main, service, and meter installations. The AMRP uses an outdated cost estimate that understates program costs, but still forms the basis for project forecasts. Management does not accompany annual budgets with meaningful schedules or resource plans. The AMRP regularly underspends its budgets. Management has not reconciled project

estimates to actual costs after work completion. These factors exemplify the need for substantial improvement in setting credible standards. The existing gaps have made effective management reporting impossible in the AMRP's first stages.

### *iii. Analysis of Performance*

A typical utility project report contains volumes of data and the AMRP's regular reporting offers no exception. AMRP reporting suffers from a problem Liberty has commonly found. Specifically, management and leadership, whether at the project, executive, or board level, frequently find themselves left to their own devices to analyze extensive data. A common failing in reports arises from the assumption that everyone, regardless of level in the organization, has the time and ability to dig behind the numbers. Such digging is required, for example to: (a) ferret out actionable problems, (b) analyze the root causes of those problems, (c) intuitively grasp appropriate actions in response, and (d) understand the resources needed to act accordingly. Regular reports too often confuse the role of the analysts who contribute to reports and those who must read and make sense of them. AMRP reporting fits this description.

AMRP reporting must change to meet the primary measure for judging a report. Directly stated, that measure consists of the degree to which reports facilitate management action. To meet this measure, AMRP reporting requires adjustments that will give management: (a) a clear description of performance gaps, (b) evidence supporting that description, (c) analysis of the primary causes of problems, and (d) clear measures and alternatives for responsive, corrective action. The discussions that Liberty and senior leadership began in September 2014 led to a significant level of consensus on the need for improvement and to the design by Peoples Gas of initiatives to secure that improvement. It remains for management to complete those initiatives. The best test of success will be to observe the changes in reports, the attitudes of management toward their use, and evidence that information reporting has produced responsive actions.

### *iv. Reporting Organization and Resources*

Well-designed program management functions employ analysts skilled in performance analysis of major, complex engineering and construction programs and projects. The skills of those individuals must also include the ability to understand the unique technical aspects of the work. Combining technical with analytical skills produces the ability to provide credible analysis and to advance workable solutions. Such capability proves invaluable to program and more senior leadership. Enhancement of the AMRP resources in this area also represents part of the Peoples Gas initiatives resulting from the discussions that began last September.

### *v. AMRP Reporting*

The AMRP monthly progress report comprises the central element of program reporting. This 50-plus page document covers all program aspects. It presents, in various formats, data illustrative of what has been done and is being done. Its primary focus is on work that occurs in the field. Liberty found the report fundamentally unresponsive to program needs. Its design to "cover all the bases" appears to create a false sense that its contents provide full knowledge of all important project events, that management is on top of all parts of the project, and that progress is on or near plan.

Reports similar to the AMRP monthly progress report tend to keep everyone happy. Such reports allow executives to feel informed and program managers to present an image of control. Yet such reports rarely speak of problems, corrective measures, or failures to perform. The notion of a manager saying through a project report that “I have a problem” is not common in the industry, and AMRP managers have certainly not done so. The December 2014 report illustrates this finding:

- Many presentations of data exist, but without context; *i.e.*, the report provides numbers, but gives the reader no way of knowing whether they represent good or bad results
- The report contains material difficult even to read (see pages 33-39).
- The report fails to provide important data and some reported data contains errors (see page 28, which Chapter B.1 of this report discusses).
- The report does not relate resource data to staffing required and its characterization of resource data as “jobs created” seems aimed at objectives other than management of the project (see page 31).
- Most importantly, no analysis accompanies any of the data, even though many charts appear to beg analysis questions.

The flaws in the report indicate lack of clarity in defining the intended audience. Moreover, Liberty’s discussions with management found that the report serves no meaningful management purpose. The many levels and sources of management responsible for oversight of the AMRP within Integrys and Peoples Gas increase the significance of this problem. Assuring common understanding of critical project status information becomes more important as authority and accountability spread to a wider set of people.

AMRP regular reporting does not provide a number of important types of support to program management, including:

- Insightful analysis by capable program management staff, including clear identification of problems and their causes.
- Specific identification of any failing organizations and managers, so that it is clear where the responsibility for improvement lies.
- A focus on what is important: On a large project, it is not possible for managers and executives to follow everything. In reporting and analysis, there must be concentration on the paraphrased adage that 20 percent of the project makes up 80 percent of the costs, risks, and opportunities.
- An action orientation: Clear discussion of the actions that should be taken and by whom. There must be clearly defined expectations for what must be done.

## **b. Controls Skills**

### *i. Background of Controls Personnel*

Liberty evaluated the background and experience of the Project Management Office’s personnel involved in project controls. Liberty’s review covered persons filling cost, scheduling, and contract management roles. Jacobs Engineering provides most of the people serving in these AMRP roles. We found the background, education, and experience of the team to be above average. Virtually all of the people are degreed professionals, with most possessing engineering degrees. Several

have advanced degrees. We found considerable experience levels as well. Six of the team members have more than two decades of related experience. Liberty considers the mix of experience on the team, from junior to senior people, excellent. As the cost, planning, estimating, and management chapters of this report (Chapters G, K, and L) explain, however, significant concerns exist with respect to the application of such skills in a well-constructed, suitably empowered organization.

*ii. Analytical Capability*

This report concludes in other chapters that the Project Management Office does not apply analytical skills broadly and deeply in examining project performance. The degree to which the organization has this capability therefore remains unknown. One might conclude from the backgrounds of the AMRP controls personnel that the organization likely has this capability if called upon, but Liberty's work found no evidence that management has made substantial demands to date.

### **3. Conclusions**

**O.1 AMRP reporting is not sufficient in level and quality to ensure that management has complete and timely information about AMRP performance and progress. (Recommendation O.1)**

Liberty focused principally on the monthly report, which program management offered as the primary source of communication. Other reports, however, have a similar lack of focus on communicating information that is well organized, comprehensive, and subjected to careful and insightful analysis.

**O.2 AMRP management has not made effective use of performance results analysis to drive improvement actions, from the board and executive management levels down to day-to-day supervision. (Recommendation O.2)**

Management is not well positioned to use performance results effectively, because it does not receive performance results in an actionable or credible way. Liberty found a lack of focus on management follow-up to address performance gaps, as this report discusses repeatedly in many chapters.

**O.3 The AMRP lacks a credible and comprehensive set of standards, which leaves it without a prerequisite to effective AMRP reporting and performance analysis. (Recommendation O.3)**

Project measurement bases should find definition in program plans and in documentation of the underlying assumptions. Budgets and schedules, for example, provide standards of performance and management's expectations regarding performance requirements. Management should hold project organizations and contributors accountable to those standards. Management cannot seek accountability where standards do not exist, or where standards lack credibility.

**O.4 AMRP management has not given strong emphasis to creating a culture and a set of capabilities for aggressive analysis. (Recommendation O.3)**

The mass of data presented to management does not lend itself to meaningful analysis or valuable insights. The organization has not yet shown the capabilities for such analysis or evidence that it recognizes the need for making analysis a central element of program management.

**O.5 The AMRP monthly progress report, (the primary vehicle for communicating AMRP progress status and results to the boards of directors and to executive management), requires significant overhaul. (Recommendation O.1)**

The monthly progress report has existed in the same form for many years. Liberty was unable to discern clear and meaningful use by managers or staff of this document. Moreover, the presentation of information in the monthly progress report does not support the identification of problems or corrective action.

**O.6 Project controls personnel, supplied almost entirely by Jacobs Engineering, have above average background, education and experience.**

Few companies recognize the urgent need to staff the project control organization with well-educated and technically capable individuals. The AMRP provides an exception. Largely through Jacobs Engineering personnel, the AMRP has a better than average team of cost and schedule professionals.

**O.7 Peoples Gas has not called upon its project controls personnel to provide the analysis and facilitation of corrective action that the AMRP requires. (Recommendation O.5)**

Given the apparent higher than average skill level of the people, the AMRP appears to under-utilize them. They likely have the capability to provide the analytical contributions that management does not appear to have demanded. The need for augmentation of cost estimating and management resources may or may not make these personnel a potential pool of resources from which to draw.

## **4. Recommendations**

**O.1 The AMRP Project Management Office should overhaul its approach to reporting, with emphasis on defining and meeting the needs of managers and staff. (Conclusion O.1 and O.5)**

The purpose of the AMRP reports is unclear, and there does not appear to be a sound objective behind the monthly report. Rather than focusing the report structure on what information the program chooses to share, the structure should emphasize what information is needed by readers and what they should be expected to do with it. The program should work with managers to define their needs and then design reports to meet those needs.

**O.2 Management should establish a framework for performance improvement based on analysis of project performance and corrective actions. (Conclusion O.2)**

One specific management need is information on program performance and how to facilitate improvements where appropriate. Management should put in place a specific process to provide a

continuing means to understand and improve performance based on strong analysis of actual progress.

**O.3 In the course of its current improvement initiatives, Peoples Gas should redefine and reestablish its standards for program performance. (*Conclusions O.3*)**

Given the current lack of standards, Peoples Gas will be unable to provide the insightful analysis needed. The current improvement initiatives should remedy this shortcoming. As Peoples Gas develops these new budgets, plans, and other relevant documents, the Company should define and communicate their intended use for future performance analysis and reporting.

**O.4 The Project Management Office should establish a culture and a regular, defined, comprehensive program that provides insightful analysis of program performance, and should acquire the capability to perform such analyses. (*Conclusion O.4*)**

The Project Management Office must overcome its reluctance to provide objective and, if necessary, self-critical analysis. The greatest beneficiary of such analysis will be the Organization itself. To accomplish this, the Project Management Office must develop an enhanced capability for analysis.

Each executive should take a more active role in demanding information and analysis from the project to fully support their oversight responsibilities. Executives must work with the program to explain their needs and insist upon necessary analysis and reports. The burden is on the project to provide that material, but executives must take the lead and insist upon responsive actions by the project on a continuing basis.

**O.5 Peoples Gas should expand the role of its project controls professionals to allow for more analysis of project progress and performance and, in turn, support of management by facilitating corrective action. (*Conclusion O.7*)**

This report addresses specific analysis improvement opportunities in a number of chapters. Management should address use of existing people to implement Liberty's recommendations in this regard. If they prove unsuitable, then further staff development or supplementing with added skills will prove necessary.

## *Chapter P Table of Contents*

Chapter P: Auditing of AMRP Costs.....	P-1
1. Background.....	P-1
2. Findings.....	P-1
a. Internal Audits .....	P-1
b. 2014 Material and Equipment Control Initiatives .....	P-2
c. November 2014 Audit of Material Reconciliation .....	P-3
d. Liberty’s Field Investigations .....	P-3
3. Conclusions.....	P-4
4. Recommendations.....	P-6



## Chapter P: Auditing of AMRP Costs

### 1. Background

Other chapters of this report address internal auditing of AMRP program and project management. Principal among such auditing has been extensive work by an outside firm over a number of years. The chapter focuses on how the Company's internal audit group (Internal Audit Services) plans and conducts audits of AMRP costs, considering the industry's use of traditional methods that assess the controls risks created by the nature, scope, and extent of work of programs such as the AMRP.

### 2. Findings

#### a. Internal Audits

Integrus applies a fairly standard overall approach in designing its internal audit plans for each year. The plans developed by Internal Audit Services consider the risks imposed by the operations of Peoples Gas. An enterprise-wide risk assessment process drives audit planning. The process, as typified by current industry thinking, identifies risks in relation to company objectives, assesses the likelihood and potential impact of the risks identified, identifies existing risk mitigation measures, assesses and incorporates additional mitigation measures determined to be effective, trends risk levels, and monitors risks and mitigation measures quarterly.

The risk identification and impact elements of the enterprise risk management program comprise primary drivers of annual audit planning. Testing related to the Sarbanes Oxley Act also forms a component of audit planning.

Internal Audit Services, sometimes using outside expertise, has conducted a number of control-related audits of AMRP since its inception. Among them are:

- 2010 Audit Plan: PwC assessment in connection with AMRP start-up addressing the program's controls environment, considering industry-leading practices for major utility capital projects (note that this audit, as well as much of PwC's follow-on work over subsequent years for Internal Audit Services, has a strong program and project management and oversight focus as well)
- 2011 Audit Plan: Review of the contractor procurement process
- 2011 and 2012 Audit Plan: Separate Reviews of compliance of Infrastructure Cost Recovery (ICR) Rider overhead cost calculations with rider requirements (one for 2010 and the second for 2011)
- 2011 Audit Plan: Verification of Infrastructure Cost Recovery Rider information sheet to verify proper calculation of and support for charges under the rider
- 2011 Audit Plan: AMRP Risk Assessment by PwC, including, among a number of program and project management and oversight matters, a review of the process for reconciling materials used versus those delivered
- 2012 Audit Plan: Verification that design of processes and controls ensured valid and proper union labor time recording

- 2012 Audit Plan: Verification that a construction close-out process adopted in the Spring of 2012 ensured payment to contractors only for work performed, after resolution of open issues, and after completion of compliance and contract requirements
- 2013 Audit Plan: Follow-up examination of materials reconciliation process to determine adequacy of measures taken to improve the process of ensuring accurate and timely materials reconciliation (found needed in the 2011 plan PwC work addressed above).
- 2013 Audit Plan: PwC assessment of AMRP governance approach, organizational structure, and processes and procedures related to the program control environment.

The 2011 audit plan's review of contractor procurement reviewed the use of a request for proposals to solicit contractor bids, the process for narrowing 12 initial proposals to eight for final evaluation, the content of the proposals, membership of the company bid evaluation team, the scoring by team members, the selection of four firms to bid on 2011 projects, and the existence of master agreements prior to work performance.

The second of the PwC engagements identified above included reviews of a number of areas material to ensuring proper charging for work performed:

- Contract administration procedures
- Effectiveness of contractor scope change control process and procedures
- Procedures to validate costs being recovered
- Validation of contractor applications for payment.

The third PwC engagement assessed design and effectiveness of program management elements, including project controls, examining:

- Project cost estimating policy and procedures in relation to individual projects, annual projects, and AMRP costs to date
- Change management policy and procedures
- Policy and procedures for procurement of materials to ensure timely acquisition and avoid construction delays
- Policy and procedures used to evaluate contractors selected for AMRP work.

#### **b. 2014 Material and Equipment Control Initiatives**

Recent Company investigations have led to a three-year program, whose implementation began at the beginning of 2014, and which consists of 42 initiatives. Integrys has completed 29 of them. They cover a very broad spectrum of actions to promote integrity (including the use of materials and equipment required for AMRP work), among other matters affecting proper use of resources, materials, and equipment. The next table summarizes Liberty's overall characterization of the areas into which the initiatives fall.

**Table P.1: Scope of Material and Equipment Control Initiatives**

<b>Commitment to Integrity</b>	<b>Fleet</b>	<b>Surveillance Camera Upgrade</b>
<b>Code of Conduct</b>	Inventory	<b>Scrapping and Disposal</b>
Commitment	Key Control	Policies
Training	Truck Content Inventory	Facility Security
Compliance Questionnaire	<b>Facilities Process Gaps</b>	<b>Purchase Cards</b>
<b>Electronic Devices</b>	<b>Tailgate Process</b>	Reports

Background Investigations	ISI Meter Tagging	Controls
GPS in Vehicles	Network Forensics Reviews	Review of Main Deposit Process
Ensuring Operability	Tracking Tool and Stock Orders	Leadership Training
Increasing Units Equipped	IT Systems and Access Thereto	Work Place Violence Training
Tampering Controls	Facilities Security Assessments	New Materials Mgmt. Program
Unauthorized Vehicle Use		

### c. November 2014 Audit of Material Reconciliation

For 2013 AMRP projects, management added to vendor contracts a requirement to: (a) maintain records supporting the reconciliation of materials delivered, transferred, and returned, and (b) explain materials variances exceeding 10 percent. A November 2014 audit by Internal Audit Services reported on an examination of the adequacy of reconciliation processes performed through 2012. The audit included visits to contractor inventory yards. The audit found the processes used inadequate for purposes of ensuring the proper recording of AMRP materials costs.

The audit found gaps (for pipes and valves greater than 2.0” in diameter) between charges in the systems used for accounting versus facilities management purposes. Extrapolating the differences across the remaining costs (*i.e.*, in addition to those not sampled in audit testing) produced a potential mismatch of \$2.6 million for materials of this diameter through 2012. The audit also found that a lack of inventory modeling created a risk of inadvertent use of expired materials. Note that, while such a risk is important, Liberty’s field investigations did not find the use of expired materials to be a significant problem. Note also that, while the mismatch reflected a significant percentage of the equipment examined, total AMRP material costs through 2013 were only about \$22 million of \$510 million in total AMRP capital spending.

Interestingly, delays in closing out AMRP projects (discussed in other chapters of the report) contributed to the material reconciliation difficulties. The delays meant that contractors had more than the anticipated number of projects or phases open contemporaneously. This factor led to contractor mixing of materials among projects and phases without sufficient documentation. This mixing affected material reconciliation adversely. Agreements with contractors in 2011 and 2012 did not require contractors to keep records that would support accurate materials reconciliation by year, by project, or by phase. The audit found program management unable to explain significant variances (over 10 percent) for those early AMRP projects for which preliminary materials reconciliations had been performed.

In addition to recommending process, controls, and training improvements for projects beginning with 2015, Internal Audit Services recommended completing preliminary reconciliations for all historical projects, and documenting all variances found. The AMRP Project Management Office accepted the recommendations generally, but stated that it “did not have sufficient information to perform material reconciliations.” Instead, it proposed to compare material release information with final as-built drawings for completed work, in order to “recommend an acceptable variance range” for material quantities.

### d. Liberty’s Field Investigations

Liberty learned that, at or near AMRP commencement, a significant unexplained absence of materials (not necessarily related to AMRP work) occurred at a Peoples Gas inventory site.

Liberty's field investigation work included a visit to a materials inventory location housing AMRP materials. At this fairly remote location, Liberty observed a lack of close control over site access. Liberty also found a lack of control over access to materials by persons who succeeded in gaining entry to the facility. Liberty found the floor lined with large bins filled with materials that one could readily remove. The materials included racks of piping and regulators to which easy access existed. A crew leader observed to Liberty that visits to the site to pick up material occasionally would find missing some materials set aside for particular work sites.

### 3. Conclusions

#### **P.1 Plans for the performance of examinations of controls associated with charges to AMRP work has occurred under a typically structured approach.**

Integrus uses a typical approach to risk identification and audit planning, and has applied it yearly to identify audit work related to internal and external costs charged to AMRP projects.

#### **P.2 Audit work addressing charges to the AMRP addressed areas of risk important to setting the foundation for the program.**

Integrus made substantial use of outside expertise to review important aspects of ensuring control over the process of charging, particularly by contractors, to AMRP work. Internal Audit Services has also examined internal labor charging controls, overhead costs charged to the AMRP, and the process for selecting AMRP contractors. The internal group's work has also addressed the reporting of AMRP costs to the Illinois Commerce Commission. These efforts showed due attention to establishing a sound foundation for ensuring accurate recording of AMRP costs and accurate reporting of program costs to the Illinois Commerce Commission.

#### **P.3 The nature and extent of ongoing AMRP work requires focused and regular attention to the verification of proper charges. (*Recommendation P.1*)**

The AMRP depends heavily upon contractors, whose costs comprise a major portion of the substantial annual costs for AMRP work. Those costs levels will remain very high for more than a decade to come.

The Company has in a number of respects placed strong reliance on the use of lump-sum and unit-cost contracts as a "natural" cost controller. This report's Chapter M: Procurement and Contracting (among others) addresses the wisdom of that reliance in terms of managing the AMRP substantively. Here the issue is verification of the match between work actually performed and that for which outside resources are compensated. Lump sum contracts do not obviate the need for careful control over change orders. Moreover, even without change orders, verification of work performance (and to applicable contract standards) remains necessary. The first line for ensuring proper charges falls, as it should, to the organizations responsible for managing contractor work.

Prudence requires consideration of the risk that typical industry line of defense does not always serve. Thus, the second line of defense that internal auditing brings becomes important. The Internal Audit Services group has done a substantial amount of work to address change orders from an administrative process perspective.

While commendable, those efforts need follow up to ensure appropriate testing of adherence to them. Those efforts also need to include testing designed to provide independent verification of work performance and resource (e.g., materials and equipment and hours spent on time and material change orders) consumption data as the AMRP progresses. Such testing has not formed a significant part of audit efforts. The review of contractor selection for one year is an exception, but one that should continue to be undertaken in the future as well.

Such testing needs to include focused examinations of the relationships between work billed and work performed, and in the context of what contracts require. Regular testing by a source outside of the contractor (or vendor)/program management relationship is key in ensuring that work paid for equals work performed. That testing needs to include verification by this outside source of claims of work performed, materials and equipment used, hours spent where they, and any other relevant items, drive costs under the contractual relationships involved. It is in this important area of verification that internal audit planning and execution need to focus at this and following AMRP stages.

**P.4 The scope of the three-year materials and equipment control initiatives instigated in 2014, indicate a substantial need for improvements in those controls. (Recommendation P.2)**

The nature and extent of the initiatives evidence a general need for enhancing controls. Moreover, Liberty's field inspection team visited an AMRP materials storage site, where it encountered concerns about controls over access to materials used for unauthorized purposes. The scope and depth of the three-year program begun by Peoples Gas about a year ago is commendable. Its scope and length, however, make it appropriate to emphasize the need for careful attention and monitoring of progress in completing the materials and equipment initiatives promptly and in a manner designed to produce lasting improvement. This concern gains added impetus from the other initiatives being undertaken by the Company to improve AMRP management, oversight, and controls.

**P.5 Control over material quantities recorded to AMRP project accounts has not been sufficient; there is no reliable way to verify that wholly accurate materials cost information underlies AMRP costs. (Recommendation P.3)**

The November 2014 examination of materials reconciliation by Internal Audit Services raises concern from the perspective of program management effectiveness. It has equal and perhaps greater concern for its potential impacts on the confidence that the Illinois Commerce Commission and stakeholders can and should have on the accuracy of AMRP costs that Peoples Gas are recovering through rates.

The amounts directly implicated by the audit's specific test work represent only a small portion of AMRP costs. That said, the casting of doubt about costs underlying even a small portion of rates undermines the regulatory confidence that should always form a hallmark of utility management and operation. Moreover, the Project Management Office belief that it does have a method for determining the level of inaccuracy that exists:

- Underscores the AMRP management, control, and oversight weaknesses that other chapters of this report address,

- Calls for development of more than the current, vague commitment to ensuring a reasonably accurate measure of inaccuracy in the known area of concern
- Begs the question of what review outside of the AMRP management organization is required to provide confidence that similar concerns do not underlie other areas of AMRP cost.

## 4. Recommendations

### **P.1 Peoples Gas should conduct a comprehensive assessment of AMRP risks associated with potential mismatches between work performed and work charged, and develop an ongoing program of annual testing designed to mitigate the risks identified. (Conclusion P.1)**

The AMRP has by now generated sufficient history to support a focused assessment of where risk exists and in what magnitudes. The Company has already addressed key areas of risk (*e.g.*, internal labor hour charges, overheads, contractor selection, materials reconciliation, and change orders) for purposes of identifying processes and procedures to control those risks. The study recommended here should focus on what steps are appropriate to ensuring that those processes are rigorously and honestly applied. In particular Peoples Gas needs to assure the Illinois Commerce Commission and stakeholders that it will perform sufficient outside testing of the integrity of reported information that drives costs and rates.

Test designers must recognize that reliance on the project management and administration organizations should be backstopped sufficiently to give confidence that project personnel are using verifiable data, and using it objectively.

The resulting program should provide for a meaningful level of annual testing. Recognizing the long-term relationships with outsiders on which the AMRP depends, it should also operate in a way that makes all outsiders in those relationships aware that their engagement in matters with charging and billing consequence is subject to certain review at unpredictable intervals.

### **P.2 Peoples Gas should provide for dedicated, executive level sponsorship of the three-year materials and equipment control initiatives program and provide a regular method of reporting progress to the Illinois Commerce Commission. (Conclusion P.4)**

The Illinois Commerce Commission did not engage Liberty to perform a forensic audit of controls associated with matters of personal integrity or honesty that may affect the AMRP, and Liberty did not do so. Thus, Liberty is not prepared to offer judgments about the sufficiency of the scope of the three-year materials and equipment control initiatives to address all the matters observed by Peoples Gas (or that may exist and not have yet been observed) that underlie the development of those initiatives.

Nevertheless, Liberty understands that risks associated with such forms of behavior comprise an area requiring comprehensive and well-executed controls. Having no independently derived knowledge of the forces, factors, and events that specifically underlie the institution of the initiatives, however, does not present a barrier to concluding that management has recognized a broadly based agenda for change. In a specific way, it reflects the breadth of the more general

AMRP management, control, and oversight initiatives that Peoples Gas has proposed since discussions with Liberty about the need for major change that arose in September 2014.

It is reasonable to conclude that the Company considers risks in the areas addressed by the initiatives to be relatively high and that those risks warrant a broad array of changes. With senior leadership already facing such a large AMRP change agenda, it becomes imperative to making a senior parent-level executive champion accountable for executing the initiatives. That executive should have accountability for gauging how deeply they are accepted and are guiding the personal conduct of executives, managers, and other employees. The executive should also be charged with reinforcing them as central to the values and culture of the enterprise. Such a champion should have the support of executive level parent (recognizing the material levels of AMRP support that come from Integrys organizations) and utility management to track and measure progress and to identify and resolve problems and progress lags quickly and effectively.

Change of the types initiated need a supportive corporate culture. They lie at the heart of ethical performance as nearly universally described in statements of corporate vision and values by major corporations today. Therefore, the boards of directors should also require routine, continual tracking of status in implementing the initiatives. The boards should also demand from senior executive leadership methods for gauging the effectiveness of measures that have been put into place.

Integrity, or more particularly its importance in the performance of public service responsibilities, also make important regular reporting to the Illinois Commerce Commission and stakeholders of progress in implementing these initiatives. The underlying circumstances implied by the magnitude of the initiatives being undertaken underscore this reporting need.

**P.3 Peoples Gas should promptly: (a) correct the potential gap that exists with respect to ensuring the accuracy of material and equipment costs charged to the AMRP, (b) develop a method for reliably and accurately determining independently the magnitude of any error in AMRP material and equipment costs being included in rate recovery, and (c) devise and implement a similarly independent testing program to verify that no material risk exists with respect to AMRP costs subject to rate recovery. (Conclusion P.5)**

The Internal Audit Services group issued its report about material and equipment reconciliation only recently (November 2014). The Company must promptly verify completion of measures that will address the inability to ensure that material and equipment costs charged to the AMRP match those actually spent. The Company also needs to verify that they have been recorded and reported under appropriate controls. Verification efforts should include the testing of specific transactions and activities.

Second, the very general comments of AMRP management about reconciliations for completed work are more notable for their observation that it cannot be done, than for giving comfort as to the reliability of valuations performed. Extremely general statements about a “variance range” need to be replaced immediately with a plan for providing a specific set of calculations (and Illinois Commerce Commission reporting) whose reliability and accuracy is fully vetted. That plan must instill confidence that it provides not only a sound method, but the most accurate one. It needs to

follow consideration of a robust range of alternatives and the best information available for populating the calculations it will require. Leadership of this effort by Company resources outside AMRP management is required.

Third, when questions arise about the accuracy of costs entered into accounts and systems that drive rate recovery, focused and high-level attention are required. It becomes prudent to ensure that one's range of vision in examining potential risks to customers is not unduly restricted by focusing only on the circumstances directly at issue. Good auditing practice, which the Integrys approach (as described to Liberty) follows, calls for robust risk assessment in forming plans for the examinations to be conducted.

What is required for the AMRP is a ground-up, fresh examination of rate risk. This examination needs to consider, but not limit itself to the materials and equipment reconciliation issue. Moreover, the examination needs to identify how the problem that has arisen may bear on what risks exist in other areas. As with the preceding element of this recommendation, that examination must fall under the direction of resources outside both AMRP and rate/regulatory leadership and management. The examination should produce a clear and comprehensive assessment of improper recovery risk, and develop plans for testing.

Reporting of the assessment and planning processes should be made promptly to the Illinois Commerce Commission on completion. The same is true for reporting of specific tests, examinations, and audits. At least internally to Integrys and Peoples Gas, if not to the Illinois Commerce Commission as well, executives outside the AMRP and rate/regulatory leadership and management chain should be prepared regularly to certify that, to the best of their knowledge, information, and belief, all costs claimed for AMRP rate recovery contain no material error. That certification should rely on explicitly stated confidence in the testing plan and the results of tests conducted. Materiality should be defined with reference to size of the retail rate elements or components under which AMRP costs are recovered.



# Part Four: Managing Work in the Field

## *Chapter Q Table of Contents*

Chapter Q: Field Work Performance .....	Q-1
1. Background .....	Q-1
2. Findings.....	Q-1
a. Materials .....	Q-1
b. Engineering Standards .....	Q-2
c. Construction Conformity to Requirements .....	Q-3
d. People Skills and Experience .....	Q-5
e. Subsurface Investigation .....	Q-6
f. Unexpected Field Conditions.....	Q-6
3. Conclusions.....	Q-7
4. Recommendations.....	Q-13

## Chapter Q: Field Work Performance

### 1. Background

This chapter addresses a number of issues associated with performance of AMRP work in the field:

- Quality of materials installed
- Conformity of field work to engineering and construction standards and requirements
- Consideration of field conditions
- Training and experience of field personnel
- Subsurface investigation
- Unexpected field conditions.

Extensive site inspections performed by an experienced Liberty team formed the primary basis of the examination of these issues. Liberty conducted many site inspections of AMRP field work across the 2014 construction season. Three Liberty team members conducted these field inspections. Each has prior familiarity with the Peoples Gas system and practices. All worked on the Liberty team that conducted a 2008 management and safety audit of Peoples Gas for the Illinois Commerce Commission. Each has more than 30 years of natural gas industry experience. Two have served state utility regulatory commissions as state safety regulators. All three have on a number of occasions examined natural gas field work from safety and from efficiency and effectiveness perspectives.

The inspections encompassed more than 12 person-weeks of on-site visits, generally at four to five sites per day. The team also met with field supervision and management to discuss activities and observations. Liberty's inspection activities encompassed a wide variety of AMRP work and crew types and locations throughout the City of Chicago. The inspections covered all three, geographically aligned Shops into which Peoples Gas divided work performed in the field. The following sections of this chapter summarize the results of those investigations, supplemented by information learned through document reviews and interviews at central Company offices.

### 2. Findings

#### a. Materials

Liberty's site inspection work included an examination of materials used. The major focus of the inspection work addressing materials included pipe, fittings, and valves. The inspections also included other material used at work sites. Liberty examined the conformity of materials with installation requirements, Peoples Gas specifications, and regulatory requirements.

The significant materials-related observations from these inspections include:

- With a single exception, pipe met requirements related to age and Company specifications. The one exception involved pipe more than one year old and stored in direct sunlight. This instance did not raise a safety issue. It nevertheless required correction because plastic pipe sitting in direct sunlight can degrade over an extended time.
- Liberty observed an installation in which two 1/4-turn ball valves had broken stops. Installers broke off the stops by over-stressing them during initial operation. Liberty's

inspector determined that the valves were of good quality. Operating them improperly caused the damage.

- In none of the cases did Liberty inspectors observe shortages of necessary materials for standard installations of mains and services.

Liberty's field inspections observed a recurring issue with specialized brackets that secure risers for gas meters at locations with crumbling or bowed foundation walls. One of the three Shops overcame this lack by using easily-installed, "pound-in" brackets. These brackets have common application for mobile homes. The other two Shops did not have a solution for these instances. For some time, the one Shop's effective solution was not shared with the other two Shops. Thus, the Shops failed to share best practices that can improve adherence to standards and efficiency at the same time.

Interviews with field personnel indicated that some material availability issues arose in 2013. Liberty's 2014 field inspections, however, found no indication of a recurrence of shortages. Moreover, interviews with contractor construction supervisors, construction inspectors, and Peoples Gas construction managers disclosed only the riser bracket issue. Ultimately, the brackets issue did not arise from material availability issues, but from failure to share a proper solution. After one Shop's personnel became aware of the existence of an option, the Company did eventually respond by making them available to all three Shops. All crews whose work sites Liberty examined had sufficient materials and equipment to perform the work.

#### **b. Engineering Standards**

Liberty's review of engineering standards and operating procedures covering main, service, and meter work in the field found them generally appropriate in providing a basis for quality installations that meet all safety requirements. Field investigations, however, disclosed a number of exceptions that warrant attention. The next paragraphs discuss them.

*Steel Straps*: Reinforcing straps should be welded onto the end caps on steel and ductile/cast iron mains (both permanent and temporary). Peoples Gas should have a standard addressing the number and size of steel straps (or "rabbit ears") and the extent of required welding. Such standards would help ensure adequate strength.

*Jeeping*: Peoples Gas should have a standard identifying when and how inspection and jeeping of coating for steel pipe should occur. Where pipe is coated or wrapped with special materials to prevent corrosion, coating integrity is confirmed through detection of bare spots using special detectors ("jeeps"). The required standard should address pipe coating thickness and associated voltages that avoid damaging coating, yet remain adequate to confirm coating integrity.

*Thrust Blocks*: Peoples Gas should have a standard addressing required sizing of thrust blocks for blocking end caps of large diameter mains. Thrust blocks hold mains in place. The standard should apply to temporary and permanent mechanical end caps.

*Contractor Training*: Peoples Gas needs to establish requirements that will ensure regular Peoples Gas review of the methods contractors use to train their personnel. The Company should verify

the sufficiency of instructor skills and experience and the training materials used to meet Peoples Gas operator qualification programs and standards. The requirements should specifically address:

- Responsibility for and documentation of monitoring and oversight of contractor operator qualification programs
- Adequacy of training of contractor personnel
- Conformance of contractor operator qualifications with Peoples Gas requirements.

*Inspector Training:* Peoples Gas needs to address four issues involving personnel who inspect field work:

- Ensuring adequate training and verifying the qualifications of AMRP inspectors
- Providing training in the installation, operation, and exercising of polyethylene valves
- Ensuring sufficient inspection of contractor work to verify compliant and satisfactory material installation
- Training in riser locating: Liberty's field work included a number of instances where meter markers set potentially unsafe riser locations. Meter markers visit customer facilities to identify locations for meters (and thus associated services and service riders) being relocated from inside to outside customer buildings. Peoples Gas manages its program to move meters to outside locations jointly with AMRP pipe replacement work.

Examples of locating problems that Liberty observed include riser locations placed within three feet of building opening and service regulator vent terminus. Such locations violate Peoples Gas procedures, and can require relocation and avoidable piping and labor costs.

Liberty also observed a number of instances where Peoples Gas does not provide sufficient guidance, training, or documentation for those responsible for ensuring field work quality and compliance.

*Inspection Documentation:* Peoples Gas needs to adopt requirements to document inspector verifications that contractor work complies with requirements, including engineering standards and specifications. The required documentation should include:

- Ensuring consistent inspections to verify quality contractor work
- Documenting daily completed contractor work at a level at least as detailed as the detailed construction checklists used by the Compliance Monitoring Group.

*Construction Verification Audits:* The Peoples Gas Compliance Monitoring Group has not consistently performed construction verification audits of contractor main and service installations to verify compliance with Company engineering standards. The Company needs to establish clear requirements to ensure consistent adherence to procedures for verification audits of contractors.

### **c. Construction Conformity to Requirements**

Liberty's inspectors used pertinent engineering standards and procedures to verify that contractor work met the requirements of contracts and that installations met regulatory and Company requirements. Liberty's inspectors questioned construction inspectors on the standards and procedures they deemed relevant. Liberty verified that copies were present on the job site. The field work confirmed the use of main and service engineering and design work performed prior to

contract award. Construction contracts call for contractors to use that information, except where not feasible. For example, contractors may find during a final walk down in the field conflicting facilities not shown on existing maps.

Thus, conformity with standards and procedures did not generally produce concern. Liberty did, however, identify five specific issues that warrant attention.

The first issue concerns depth of cover over installed pipe. Liberty found a significant level of confusion about the depth of cover required for services located on customer property and those in City rights-of-way. In many situations the depth of cover used for both customer and City locations is 18". Per the Field Manual Section 920 (Table 920.1), however, the minimum main depth of cover in City rights-of-way is 30". The minimum service depth of cover is 24". Some permits may specify another minimum depth of cover (such as 36"). Peoples Gas needs to address this confusion, by correcting the table or issuing separate instructions for contractors working in Chicago.

Liberty also observed instances of confusion about where customer property stopped and rights-of-way began. Moreover, some City permits specify a non-standard cover requirement. Liberty did not find a routine practice for determining the requirements to apply in cases of differences between permits, City regulations, and Peoples Gas standards.

Second, Liberty observed a number of cases where following pre-designed main locations reduced efficiency. In some cases, following those layouts would cause greater conflict with existing underground facilities than alternative layouts might produce. In such cases, these layouts would require less efficient open trenching. More efficient, horizontal directional drilling could not be used because of the conflicts found. A second example of problems occasionally arising from pre-designed layouts, as observed by some contractor personnel, is that installation in the parkway would preclude horizontal directional drilling, while placement under a sidewalk would allow it.

Third, Liberty observed that one of the three Shops employed a rule requiring direct burial of all mains of 6" or greater in diameter. Rote application of this rule in cases where no interferences exist reduces efficiency.

The fourth issue concerns the amount of interior piping required to serve premises with multiple meters (*e.g.*, multi-family or commercial). Moving interior meters to the outsides of premises forms a significant part of the work performed in conjunction with AMRP pipe replacement. Doing so at premises with a large number of meters can require very large amounts of interior piping. Placing meters outside in one (or more) meter banks still leaves the need to run interior pipe separately for each customer involved. One can often feed meters located inside a building through a single line placed in the basement at a location that reduces interior pipe requirements. Having several services to the building can permit locating banks of meters closer to customer locations. This approach can avoid the need to run piping from one side of a basement to the other side.

The fifth issue concerns the design pressure for systems moving from low to higher pressure. As with meter relocations, Peoples Gas manages its program for increasing system pressure with AMRP work. The Company installs materials that support operation at 60 psi, but tests them only

for qualification to operate in a 20 to 30 psi system. Testing for 60 psi operation would better support future growth, by allowing the same facilities to deliver greater amounts of gas at the higher pressure. Certifying new mains and services at 60 psi would entail no added material or testing costs. The Company simply needs to change its test basis for mains and services to 90 psi. Testing requirements call for 1.5 times the maximum pressure. This change would qualify new systems in Chicago similarly to most other city systems that use medium pressure.

Liberty's inspection team found some Company procedures and standards cumbersome to use or in conflict with other requirements (such as those addressing depth of cover).

#### **d. People Skills and Experience**

Liberty's field investigations found that the contractors installing mains and services employ crew members having sound skills and experience. Their work performance generally indicated sufficient capability to perform the tasks associated with installation work. They operated under supervision that also exhibited sufficient skills and experience.

The Peoples Gas field forces exhibit a characteristic typical of the industry. Its workforce, both bargaining unit and management, is aging. The Company will lose the many seasoned and experienced workers approaching retirement age. The absence of a long-term program to replace them will threaten the ability to sustain current levels of skills and experience, let alone to expand work performed internally. Liberty observed a number of factors affecting the ability to sustain internal resources:

- Incenting union crew leaders to become first-level supervisors
- Retaining experienced personnel after they have reached retirement benefits plateaus
- Establishing a structured approach to optimizing contractor use long-term
- Addressing current shortages of skilled personnel in some positions
- Dealing with a lack of sufficient numbers to provide effective work supervision and oversight
- Responding to frequent job changes and lack of prompt filling of positions due to rotations of shop-level management positions
- Filling the need for more shop-level gas workers and of trained mechanics.

Staffing issues like these can produce efficiency loss and raise safety issues. Examples of losses in efficiency include lack of supervision of Peoples Gas crew tasks. The work involved includes tie-ins, meter transfers, and gas-in of new facilities. Liberty's field inspectors observed instances of failure to begin work promptly in the morning and slow completion of tasks when supervision was not present. Other conditions observed during field inspections, often times with notable frequency, include:

- Service risers too close to building openings
- Failure to provide supports for service risers
- Vent pipes too close (within 3') to building openings
- Service lines (as noted earlier) at insufficient depth (minimum of 18" or 24" depending on location)
- Lack of sufficient mark-outs for some utilities.

#### **e. Subsurface Investigation**

Peoples Gas uses standard methods for determining the location of subsurface facilities. These methods include referencing to owner and operator maps, contracting locator service providers, undertaking electrical location testing with toning equipment, and having owners and operators perform locations, for example. An issue occurring before AMRP inception and involving a directional drill (“HDD”), led Peoples Gas to institute video recording of all sewer mains and laterals, prior to and following directional drilling, but before “gassing-in” the new main involved.

Training comprises another important component of effective subsurface damage prevention. Training for Peoples Gas crews, contractors, and other subsurface utility facility owners and operators seeks to reinforce the need to call for complete mark-outs of all utility facilities before excavation begins. Where doubts exist about subsurface facility locations, greater care must be taken. Hand digging, performing test holes until facilities are located, or changing the route to avoid conflicting installations exemplify the methods used in such cases. Additional technological methods of locating underground facilities exist, such as ground penetrating radar. They generally do not prove necessary (and are expensive) when good maps, good procedures and good care exist.

Where subsurface facilities cannot be located via conventional methods, alternatives exist. The operator can change from direct drilling to direct burial via trenching, perform more exhaustive locating surveying with conductive toning equipment, or use historic records to determine possible locations, followed by test holes to confirm the exact location. While sometimes an effective option for limited use, ground penetrating radar is too expensive and time consuming to form a regularly used tool.

#### **f. Unexpected Field Conditions**

Liberty’s field inspections undertaken during the 2014 construction season did not find unexpected field conditions to present significant barriers to performing installation work.

Prior to contractor bids on AMRP work, Peoples Gas performs work that specifies the route, considering anticipated conflicts with other subsurface utilities. This work also specifies a method of construction. Those performing design work conduct one or more walk downs of each City block involved just prior to contractor mobilization. Route planning considers large trees, whose roots can affect directional drilling. Meter markers provide new meter locations on the outsides of affected buildings. A coordinated City process supports acquisition and use of data from the other subsurface utilities to design a route that minimizes interferences. This report’s Chapter T: Government Coordination describes that City process.

Despite best efforts, unexpected conditions can arise. For example, maps of subsurface utilities sometimes prove incorrect. Efforts like mark-outs and sewer system video recording can expose some of those variances. When field personnel discover unexpected conditions, inspectors contact design personnel to report the issue. Should the required change prove significant, Peoples Gas may need a permit change, which can produce schedule delay. More typically, however, conditions can be accommodated by changing a new main’s location from the parkway to the sidewalk (or vice versa).



Peoples Gas' video recording of sewer mains and laterals before and after a direction drill constitutes a best practice. It eliminates the risk of cross boring into a sewer or sewer lateral. Cross boring creates a future hazard in circumstances where the operator cleans sewers and laterals with a rotating heat/cutter type tool.

This report's Chapter C: The Peoples Gas Distribution System addressed the unusually large number of third party damages to the Company's facilities. New installations require appropriate mapping to help mitigate the risk of such incidents. After installation or gassing in of a new main, an inspector from an engineering contractor measures its location. The contractors use tape measures and a "walking wheel" measurer. This data is then submitted for entry into the Peoples Gas mapping system. These manual (paper) handoffs can lead to errors and omissions. Using sub-meter GPS (a system that produces much greater accuracy) in areas with satellite access may offer a more accurate method of updating mapping, geographic information system, and property records. It would also produce an electronic record of the dates. Similarly, GPS technology could provide for seamless leak data integration into models.

This enhanced capability could also extend to other information needed for leak management, customer information systems, geographic information system, system mapping, system planning, and risk-ranking algorithms. Making the transition to GPS use would require a shake-out period involving use of old and new methods concurrently. It would also require expenditures to provide field personnel with sub-meter GPS devices for recording locations of mains, services, and leaks.

### 3. Conclusions

#### **Q.1 Material availability and quality have supported effective and efficient field installation.**

Liberty's field investigations disclosed no substantial work hindrances caused by lack of materials and equipment. Storage areas appear to have ample quantities of materials. The quality of materials being installed appeared satisfactory.

#### **Q.2 The standards to which AMRP resources perform field work generally support safe and reliable installations, with a number of specific exceptions that Peoples Gas needs to address. (*Recommendation Q.1*)**

Liberty's field investigations considered the standards under which contractors and Peoples Gas crews perform main and service installation, meter relocation, and pressure-increase activities. The standards used typify what one generally finds in the industry. Chapter C: The Peoples Gas Distribution System addresses engineering and design in more detail. AMRP field work generally conformed to those standards. Liberty's work, however, did identify a number of areas that require attention with respect to construction standards or to activities designed to ensure that work meets those standards. These areas include: Steel Straps, Jeeping, Thrust Blocks, Contractor Training, Inspector Training, Compliance Monitoring Group ("CMG") Training, Inspection Documentation, and Construction Verification Audits.

**Q.3 Construction inspectors have not routinely used the checklist process to record and provide a basis for performance analysis and their power to halt unsafe work appears to be in question. (Recommendation Q.2)**

Liberty's field work disclosed that some construction inspectors have not used checklists correctly. Some also defer completing them until the end of the week. Discussions with AMRP and Shop management also indicated lack of a structured or widespread effort to use checklist information. This data provides a basis for discussing and identifying means for correcting recurring or systemic performance issues. The use of the checklists has importance in ensuring consistent and thorough review of individual contractor performance. The checklists can also provide significant insights into issues that adversely affect work effectiveness, efficiency, and duration.

Liberty's field work also identified uncertainties among inspectors about their power (absent real-time clearance from a higher authority) to halt work activities that raise safety concerns. Giving that power to inspectors is critical to ensuring work performance that meets safety and performance requirements and expectations. Inspector lack of confidence or respect from field supervision may well contribute to this situation. Peoples Gas must recognize that denying inspectors the power to take immediate action does not offer a solution. A better approach lies in proper inspector empowerment and in training and communication about their role and authority.

**Q.4 Contractor field resources demonstrate sufficient capabilities to perform the main and service installation work that comprises their portion of AMRP work.**

The contractors selected to perform AMRP work undergo pre-selection evaluation. Their crews and supervision, as observed by Liberty in field investigations, demonstrated sufficient competence and effectiveness in field work performance. Liberty's discussions with Peoples Gas field management personnel disclosed no significant performance issues. Note that this conclusion does not address sufficiency of resources to support overall schedule requirements.

**Q.5 Peoples Gas has had difficulty in filling internal positions responsible for AMRP work, and, like the industry as a whole, faces graying workforce issues that can cause skills gaps to widen over time. (Recommendation Q.3)**

Maintaining an adequate number of skilled and experienced personnel forms a central element in ensuring work quality, timeliness, and efficiency. Peoples Gas faces current shortages in a number of positions. Liberty's review also confirmed the risk that shortages will increase, given the demographics of the internal workforce. Like others in the industry, Peoples Gas faces the loss of growing numbers of skilled workers and supervisors as retirement ages approach. A combination of disincentives to remain after reaching benefits plateaus and increased employment opportunities in an improving economy further increase employee retention risk. The growth of accelerated main replacement programs around the country adds further risk.

The discussions that began last September between Liberty and senior leadership produced consensus on the need to address internal resource numbers and skills, both short- and long-term. A comprehensive analysis of needs across the immediate and the longer terms should take place. Peoples Gas also needs to identify methods to incent bargaining unit employees to enter supervision and retirement-eligible workers to remain.

**Q.6 A number of factors increase the difficulties that Peoples Gas has in providing sufficient numbers of experienced personnel. (*Recommendation Q.4*)**

Liberty's field investigations and interviews with field management disclosed a number of specific personnel-related concerns that contribute to performance, safety, and compliance issues.

Peoples Gas has experienced a significant level of vacancies in key field supervision and inspection positions. The utility has not filled vacancies resulting from retirements, promotions, and reassignments at a sufficient rate to sustain resource levels at effective numbers and levels of experience. The growth in work occasioned by the AMRP and other work growth (such as the increase to medium pressure and the relocation of meters to outside locations) has placed significant strain on resources. Frequent switches in job assignments have produced many cases where job holders have short tenures in current, key positions (*e.g.*, shop construction supervisor and manager positions). Moreover, incentives to retain people in key positions and to encourage experienced workers to take supervisory positions are not strong.

Peoples Gas has consequently experienced a shortage of trained personnel to fill supervision and inspection roles. The impacts show in what Liberty's field inspection team found to be comparatively weak levels of supervision and oversight, particularly with respect to work being performed by Peoples Gas crews. Moreover, it is clear that there have been delays by Peoples Gas crews in accomplishing their designated elements of AMRP work. As contractors continue to perform substantial numbers of gas main and service replacements, the gap threatens to widen, absent expansion in the number and capabilities of Peoples Gas resources.

Compounding the difficulty, AMRP work must compete for resources with other programs that Peoples Gas must conduct contemporaneously (*e.g.*, compliance and leak management). Senior Peoples Gas executive management acknowledges the need for increased resources and for addressing together the AMRP and other needs that will continue to require substantial resources into the future.

Problems in maintaining sufficient numbers and experience levels also lead inevitably to losses in productivity and accountability for work completion. These losses appear in a number of ways; *e.g.*, increased use of overtime, poor location of service riser mark-outs, errors in work performance and resulting rework, and increased restoration costs when service transfers are completed after initial restoration following new main installation.

**Q.7 Peoples Gas' designation of roles and responsibilities for oversight of work effectiveness, quality, and safety is unclear, and fully effective means for supporting the execution of those roles do not exist. (*Recommendation Q.5*)**

*Field Supervision*

Liberty's field investigations found a lack of supervision of some Peoples Gas crews. Liberty observed in a number of cases the absence of on-site supervision and a lack of visits by responsible supervisors. Each of the three Shop areas has vacancies for first level supervision. Liberty's understanding of the benefits of entering supervisory roles indicates lack of sufficient material incentives for seasoned crew leaders (a natural source of expertise) to become non-union supervisors.

Liberty also observed high turnover of supervisors. They appear to get re-assigned often to programs or areas having immediate priority. The utility's failure to find sufficient numbers of experienced personnel contributes significantly to the observed lack of supervision. Liberty observed a similar gap in its 2008 audit for the Illinois Commerce Commission. At that time, however, the cause was the amount of paperwork first level supervisors had to complete in the office, thus keeping them away from crews in the field.

#### Meter Markers

Liberty's field inspections disclosed a number of cases where inaccurate marking of new meter locations raised concerns about compliance with safety and with Company procedures and standards. The work that Peoples Gas performs under common management with AMRP replacements involves moving to outside locations meters currently located inside customer structures. Marking the new locations thus comprises a significant effort. Completing the work that new main and service installation by contract crews initiates has been a problem for Peoples Gas. Adding to the problem, a lack of knowledge on the part of overly stressed and busy workers performing meter markings has produced violations and cost impacts for corrective work.

#### Supervision of Contractor Crews

Peoples Gas assigns a construction inspector to each contractor crew installing mains and services. However, Liberty's field investigations identified a lack of sufficient skill and experience levels of Peoples Gas construction inspectors. Many construction inspectors did not have gas or any other pipeline inspection experience prior to their hiring. The training they received is more appropriate for individuals with extensive gas construction experience such as former employees familiar with the Peoples Gas system. A majority of inspectors have come from other types of construction (e.g., highway, water main, buildings). The mentoring provided comprises a good practice, but the quality of mentoring is also a function of expertise in gas construction.

#### Technical Training and Compliance Monitoring

The Company also needs to identify and empower a single source for providing ultimate guidance for field personnel questions involving operations and materials procedures and specifications. At present, contractors who have questions regarding standards or procedures rely on the advice they obtain from the construction inspectors, who may or may not have the needed experience or knowledge.

Another Integrys-based group, Technical Training has responsibility for training Compliance Monitoring Group inspectors. This group trains all Peoples Gas employees in safety, operating procedures, compliance, and Operator Qualification matters. Technical Training personnel should serve as the definitive source of guidance. Technical Training should be the most knowledgeable about Company procedures and standards and how they relate to compliance with state and federal safety regulations. The Technical Training staff, however, also has many members who lack substantial experience. Liberty also observed a loss of knowledge and expertise in Technical Training with regard to standard operating procedure requirements. Over the last several years, Technical Training lost many experienced staff members through retirements. This loss, coupled with changing standards and procedures (e.g., an Integrys standardization program) has left the new management of Technical Training inexperienced in providing day to day answers to technical issues.

Liberty found some construction inspectors and Compliance Monitoring Group auditors confused about their roles and responsibilities when they observe non-compliant work or work methods.

#### Operator Qualification

The Pipeline and Hazardous Materials Safety Administration requires that pipeline operators performing covered tasks undergo evaluation intended to demonstrate the ability to “perform assigned covered tasks and recognize and react to abnormal operating conditions.” Peoples Gas has the responsibility for ensuring that the resources it employs are operator qualified.

Liberty found instances of contractor non-compliance with the standard operating procedures and standards program of Peoples Gas, particularly with respect to: (a) required operator qualifications (“OQ”), gas system mark-out (to avoid third-party damages when working in the vicinity of gas facilities) accuracy issues, providing adequate ground cover (above replaced mains and services), providing adequate service regulator vent terminus clearance (minimum distances from opening in buildings through which gas can migrate), performing meter marking to promote efficient interior piping, and thrust block sizing. In one instance an operator of a directional drilling machine did not have an up-to-date certification.

In addition, Liberty’s field investigation team made inquiries of those with proper certification about Abnormal Operating Condition (“AOC”) training. A person qualified to perform covered tasks must have the ability to respond appropriately when faced with abnormal operating conditions reasonably expected to be encountered when performing that task. In many cases, the responses produced an apparent lack of knowledge about what would comprise an abnormal condition for their operation. This observation applied to contractor personnel and the construction inspectors trained by Peoples Gas. The construction contractors and subcontractors were trained by an outside organization. The training provided appears to have gaps. Peoples Gas should be reviewing and clearing training material.

Liberty found a lack of full control by Peoples Gas of the quality of contractor Operator Qualifications programs or of similar programs for those inspecting contractor project work. Inconsistencies exist in the nature and degree of oversight of contractors by Peoples Gas inspectors and in approaches that the three Shop areas take to resolving field needs and issues. How inspectors carry out roles, document inspection activities, use inspection checklists, and prepare reports also exhibited inconsistencies.

### Quality Control

Concerns exist with respect to quality control as well. Designation of the source of authority for quality control is not clear. The approaches applied to contractor quality control programs lack consistency, as do those processes for training and uniform knowledge and skills requirements for contractors and inspectors. In addition, Peoples Gas does not apply a consistent approach in addressing field questions, complaints, and improvement suggestions.

#### **Q.8 The high rates of turnover, the lack of experience among replacements, and the slow pace in filling some positions make the need for training a particularly high AMRP priority. (Recommendation Q.5)**

Peoples Gas does not provide training in a reasonably uniform manner to those who require it, and its training programs do not fully reflect the needs of a work force that has a large number of people filling roles in which they do not have significant experience. Moreover, when making organizational and process changes to address oversight of work safety and quality, the Company will have to provide training intended to ensure that those responsible for key roles understand their authority and how they need to execute it. Training regarding procedures and standards for construction inspectors requires particular attention.

#### **Q.9 Peoples Gas has applied appropriate subsurface investigation methods.**

Peoples Gas has generally been able to install new mains and services required by the AMRP in a safe and low risk manner by employing methods typically used in the industry. The Company has succeeded in locating its own and other utility subsurface facilities accurately and in a timely manner. When encountering difficulties in determining the location of subsurface facilities, Peoples Gas has used conventional methods successfully.

#### **Q.10 Unexpected field conditions have not presented an abnormally high number of problems for AMRP installations, but the high incidence of third-party damages to Peoples Gas facilities indicates the need for examination of better methods for mapping new installations. (Recommendation Q.6)**

Liberty's field work did not observe an unusual level of "surprises" affecting the ability to make installations as planned. Pre-construction work to investigate field conditions takes industry-typical forms. Peoples Gas has taken action to improve the locating of subsurface utility locations by performing follow-up quality control checks on problematic service providers, performing test holes to physically locate services, and using meter markers to locate entry points of legacy services on plot plans.

The high number of third-party damages to Peoples Gas facilities (described in this report's Chapter C: The Peoples Gas Distribution System), however, does raise concern about the marking of Company facilities. Peoples Gas currently uses manual processes to map new main and service installations. These processes can introduce errors in fixing the locations of new installations. Moreover, Peoples Gas currently uses building property lines measured from existing street corners. These corners can change, further reducing the accuracy of maps identifying Peoples Gas subsurface facilities. Considerable time can also pass between converting manually measured locations to geographic information system coordinates for placement on maps supplied to locating and mark out personnel and service providers.

Urban environments with a prevalence of very tall buildings can make it problematic to obtain a sufficient number of GPS satellites to locate mains and services accurately. Many Chicago neighborhoods undergoing AMRP work, however, consist primarily of low-rise residential structures that do not present this difficulty.

#### 4. Recommendations

**Q.1 Peoples Gas should address a number of construction standards' needs, and should enhance training, documentation, and auditing in a number of areas related to construction standards. (Conclusion Q.2)**

Peoples Gas needs to address requirements related to the use of steel straps, jeeping, and thrust blocks. Moreover, the Company needs to address contractor and inspector training, in order to ensure compliance with Company and regulatory standards. The Company also needs to improve consistency and documentation of field work inspection, and consistently perform construction verification audits of contractor work.

**Q.2 Peoples Gas should adopt measures to ensure consistent use of construction inspection checklists, develop a structured program for analyzing the information they produce to identify and respond to field performance issues disclosed, and clearly empower inspectors to halt unsafe work. (Conclusion Q.3)**

Company-proposed initiatives resulting from discussions between Liberty and senior leadership include the initiation of an audit process intended to verify that all inspectors use the forms, use them correctly, and complete them promptly. This initiative, if implemented effectively, should address the need for ensuring that inspectors fill out the forms completely, do not allow them to accumulate for several days before completing them, and complete them under approved standards, with proper content, and on a timely basis.

Achieving these completion objectives, however, does not go far enough. The Company needs to add to its initiatives the design and implementation of a structured program, under dedicated oversight within the AMRP management organization, for analyzing the forms to determine where the information they capture identify performance problems. This analytical program needs to consider where such problems may exist in a variety of areas; *e.g.*, a particular contractor, employee performance in a geographic area, an engineering or construction standard, or an AMRP-wide work activity.

Liberty's field observations also indicate that Peoples Gas needs to provide additional training for construction inspectors, in order to improve their ability to recognize work that fails to comply with regulatory and procedural requirements. Similar training is in order to enable inspectors to better recognize abnormal operating conditions ("AOC"), and to document deficiencies in contractor training.

Most importantly, Peoples Gas needs to make clear to inspectors their power to halt improper work or activities as and immediately when they observe them.

**Q.3 Peoples Gas needs promptly to conduct short-term and long-term analyses of its requirements for skilled and experienced field resources, develop incentives for moving personnel into new positions and incenting senior workers to remain, and ensure that training and development efforts anticipate (and not merely react to) vacancies. (*Conclusion Q.5*)**

Performing a comprehensive field resource needs analysis represents a key first step. The Peoples Gas initiatives resulting from discussions between Liberty and senior leadership include plans for a needs analysis that will identify potential losses of first-level and general supervisors reaching retirement age. Peoples Gas should supplement that “numbers” analysis, which is appropriate, with an examination of the likely training and development needs for potential replacements.

The Company seems to understand that incentives to move into supervision and to remain with the Company after reaching retirement benefits plateaus must form part of its plans for ensuring adequate resources over the long AMRP duration that remains. The Company has acknowledged the long-term need to promote first-level supervisors from within (*e.g.*, moving well qualified and motivated crew leaders into management from this current highest union position). Such movement historically has provided an important source for acquiring first-level supervisors.

The needs analysis should look closely at the utility worker (formerly called gas mechanic) position, given the time it takes to fully qualify such mechanics. That training time makes it too late to begin the training process when a vacancy occurs, or becomes imminent.

Disincentives for crew leaders to leave the union and become first-level supervisors include loss of job security, reductions in some benefits (*e.g.*, pensions), and direct financial impact from loss of overtime premiums. The industry generally faces this problem, but changes in the Peoples Gas pension plan may exacerbate it. The Company must address the supervision shortage immediately. Liberty’s field work indicated instances of very little supervision of some AMRP work performed by Peoples Gas crews. Productivity impacts become inevitable when a lack of reasonably close and present supervision persists. The Company must examine and develop rewards programs that offer experienced crew leaders sufficient incentives to move into supervisor positions. The Company must also recognize the “vacuum” effect of employee movement into other positions. Movement into supervision will create a need for movement of gas mechanics into crew leader positions, thus threatening a resource area already under stress. In turn, measures to develop personnel to perform the work of gas mechanics must increase.

Short-term plans incorporate the use of contractors to fill vacant positions. Despite the importance of filling key vacancies “through any means available,” Peoples Gas needs to focus on the long term. With respect to the AMRP that long term still approaches two decades. Peoples Gas resource acquisition, training, and development initiatives require clear and aggressive time frames. Such time frames avoid the inevitable tendency for inertia to convert a short-term approach into the long-term approach.

Using contractors on a long-term basis for positions like meter markers, construction inspectors, and Compliance Management Group auditors will not likely prove most efficient over the long term. Moreover, developing an internal resource capability to address threats to future contractor



resource availability makes sense. The number of other companies pursuing and likely to initiate accelerated main replacement programs make future contractor availability a risk.

Company improvement initiatives contemplate a study of the optimal use of contractors versus internal employees. Peoples Gas must complete that study very promptly for it to have value in influencing resource acquisition. The Company must consider all costs and benefits involved. They include the value in developing resources that will outlast the AMRP, the costs of training short-term contractors, and the broader impacts of creating incentives designed to meet specific, targeted AMRP resource needs.

Peoples Gas must consider AMRP needs when conducting management position rotations. Those rotations have produced openings that have taken significant time to fill, and have caused disruption in some cases, as new position holders gain experience.

**Q.4 Identify and pursue means to increase the stability in and the numbers of field supervision and inspection personnel. (*Conclusion Q.6*)**

Discussions with senior management make clear its recognition that Peoples Gas faces resource restrictions that affect AMRP performance. A comprehensive understanding of the size of the resource gaps in areas affecting safety and compliance, however, must depend upon progress in improving overall planning, management, and control of the AMRP.

Nevertheless, on an immediate basis, Peoples Gas needs to begin addressing barriers that exist to securing resources to enhance supervision of crews.

The Company should undertake a focused examination of the incentives necessary to induce union crew leaders to become first level supervisors, as an alternative to filling vacancies through outside hires with limited gas operations experience. Current disincentives to internal succession include retirement programs, pay, and other benefits. The timeframe for filling first level supervision positions is long, as is the learning curve for outside hires. Peoples Gas needs to begin to address vacancies before they occur, even at the expense of temporarily having extra supervisors. Their ability to be trained and mentored by senior general supervisors prior to being assigned to crews will represent resources well spent in the interests of long-term AMRP optimization.

The Company also needs to promote a greater level of continuity in AMRP management and supervisory ranks at the Shop level. Minimizing job shifts that deprive the local Shops of key resources needs to become a priority. Doing so will permit faster resolution of issues by personnel not in the process of learning on the job. Greater stability will also help to make lines of authority and responsibility more clear. Lack of clarity about who (*e.g.*, the Project Management Office versus the Shop areas, Integrys versus Peoples Gas) has responsibility and accountability for what decisions and actions will improve performance beyond what our field inspection teams observed.

**Q.5 Clarify responsibilities for key field roles and institute training programs to support them more fully. (*Conclusions Q.7 and Q.8*)**

The Company needs to make clear that Technical Training is the recognized authority for guidance involving safety, operating procedures, compliance, and Operator Qualification matters, for both Integrys personnel conducting AMRP work through the Project Management Office and Peoples

Gas personnel working under management in the three Shop areas. It must also be made clear that Compliance Monitoring Group personnel are not only monitoring or advisory resources, but have the authority to address field safety and compliance issues directly and as they arise.

Technical Training needs to rework and expand the training for construction inspectors. It needs to design training that will ensure that inspectors are completely knowledgeable about Company procedures, standards, and regulatory requirements. It should undertake that effort based on a focused effort to identify the principal and recurring gaps and other problems.

The training should include practical, hands-on treatment of issues (*e.g.*, fusing and Operator Qualification requirements). It should also focus on how to spot poor quality work and who to call when questions or concerns arise. Technical Training should also make available and ensure that field personnel know how to gain prompt access to a knowledgeable person who can respond in a short time frame. Construction inspector training also needs to include City permit requirements and clear information on what requirements take precedence when conflicting or differing requirements apply (*e.g.*, City versus Peoples Gas standards; depth of cover requirements for city rights-of-way versus customer property).

Technical Training has lost expertise due to retirements and the use of contract instructors. It is therefore necessary to conduct a review of resource numbers, skillsets, and experience needs, followed immediately by preparation and prompt execution of a staffing plan to meet identified needs.

Technical Training also needs to review and improve the Operator Qualification training that contractors, subcontractors, and the construction inspectors receive. The goal of this review is to identify gaps in meeting the requirements of the Company, agreements with contractors, and applicable regulations. Particular attention needs to be paid to Abnormal Operating Condition training, to ensure that individuals know how to identify abnormal conditions associated with their positions, and what to do in case one occurs. This training is extremely important in preventing minor incidents from becoming problems. The training program of the Midwest Energy Association should be reviewed. If additional training is necessary, it should be required to be given by the Company or by an outside, approved training group.

Technical Training needs to bring the training of the meter markers back under its jurisdiction. Responsibility for such training moved to the three Shops (into which Peoples Gas divided its field operations and which managed the employee crews who perform back-end AMRP work) in 2013. Meter markers perform activities that determine the locations of meters to be moved outside of customer buildings. Meter locations affect interior piping amounts, service locations, and riser locations. Peoples Gas acquires meter markers from a contractor. The personnel provided by the contractor do not necessarily have gas distribution system experience. Recently, the contractor who supplies construction inspectors has promoted personnel from meter marker positions after assuming wrongly that individuals promoted have had adequate training.

Peoples Gas needs to become more engaged in the quality control programs of the prime contractors and some subcontractors. The utility retains ultimate responsibility for the installation and quality of construction. The Company should: (a) make itself aware of the content, resources, and methods contractors use to assure quality, (b) confirm their adequacy, and (c) see to the prompt

closing of any gaps. Peoples Gas must audit and provide guidance to the contractors and relevant subcontractor quality control programs, and ensure that these programs are designed, implemented, and audited in a manner designed to provide quality workmanship, and to meet all procedures, construction standards, and requirements.

**Q.6 Peoples Gas should examine the benefits of equipping technicians with sub-meter accurate GPS devices in areas that have line of sight to satellites. (Conclusion Q.10)**

The Company currently uses manual methods and paper handoffs from field personnel to map the new facilities installed. These processes produce errors and omissions. Equipping technicians with GPS capability can eliminate many such sources of error. Using sub-meter GPS in areas with satellite access may offer a more accurate method of updating mapping, geographic information system and property records. It would also produce an electronic record of the dates. Similarly, GPS technology could provide for seamless leak data integration into models.

## *Chapter R Table of Contents*

Chapter R: Work Management .....	R-1
1. Background .....	R-1
2. Findings.....	R-2
a. The Work Management Process .....	R-2
b. Work Management Process Improvement.....	R-5
c. Work Management Tools .....	R-5
d. Construction Work Packages .....	R-7
e. Construction Work Management.....	R-8
f. Support from Other Work Groups .....	R-8
g. Permit Coordination.....	R-10
3. Conclusions.....	R-11
4. Recommendations.....	R-13

## Chapter R: Work Management

### 1. Background

This chapter addresses the means by which AMRP management defines and manages the work processes required to perform AMRP project work. The chapter:

- Describes the overall work management process
- Examines the tools used to manage work
- Evaluates construction work packages and management methods and activities
- Assesses management methods for improving work processes
- Reviews means to address the work of groups whose activities support construction
- Evaluates the effectiveness of work to secure permits needed to authorize construction activities.

Workflow management refers to the creation of a repeatable business process documented and subjected to a defined set of procedural rules. Process definitions identify the activities, procedural rules, and control data used to manage a defined flow of work. Work (often termed “workflow”) management systems use software to store and interpret process definitions and to create and manage workflows. These systems typically support administrative and supervisory functions. For example, they provide a basis for work reassignment or escalation, they provide auditability, and they provide management information.

Modern work management systems support: collaboration on work processes, automation of redundant tasks, ensuring that uncompleted tasks undergo follow-up, creation of performance metrics for all elements of work flow, visibility to processes expected to be in place, knowledge of activities that slow progress, and identification of processes that may benefit from analysis and management attention. Examples of capabilities supported by modern work management systems include:

- Expediting the viewing, tracking, and comparing of costs
- Reporting tools that support more detailed budget analysis
- Work order control and communications
- Comparisons between cost estimates and actual costs
- Inventory support
- Work order management
- Fleet management.

Sophisticated work management systems, despite high costs that can run to the tens of millions of dollars, have become more common among utilities. Such systems support close management of capital and O&M project and program work activities from initiation to completion. They incorporate engineering release, procurement of materials, estimation of cost, work scheduling, preparation of the work plan, crew assignment, and job closeout. The scope, complexity, and duration of the AMRP clearly justify a substantial level of commitment to designing and implementing work management processes and tools of a reasonably sophisticated nature.

Liberty examined how Peoples Gas conducts work management. This examination included a review of how specific AMRP work orders flows through program processes.

## 2. Findings

### a. The Work Management Process

#### i. Process Description

Discussing work management processes requires an understanding of the flow of AMRP work activities, around which work management centers. The AMRP work management process focuses on projects, which have three important levels of definition under the program. The AMRP makes “neighborhoods” the first level of project definition. These neighborhoods correspond to 228 areas of the City of Chicago. The second level of project definition separates many of these neighborhood-level projects into phases. The phase designation seeks to support a logical division of work large enough to justify subdivision and that may continue across multiple years. A third level of project definition also exists. Within a phase, AMRP management may assign distinct project status (numbers) to work activities segregated for accounting purposes.

AMRP project information enters the Company’s Work Management Information System (“WMIS”) upon completion of design. Management usually arranges for design work to occur at the neighborhood level. This approach can produce efficiencies. It does so by allowing contractors to pass along the benefits that can arise from projects with larger scope. Such projects, for example, can produce lower fixed, or overhead costs as a percentage of total costs. Contractors installing mains and services or providing design drawing services can bid on the broadest AMRP project scale practicable. They need reliable information to use as a bid basis. Management terms the design as it exists at this point the “WMIS Design.” That design supports the preparation of a preliminary cost estimate, which simply multiplies the design documents’ installation quantities by unit rates established for the relevant “compatible units.”

These compatible units comprise defined, standardized assembly units for which management identifies costs from historical and other data. Compatible units include factors such as labor tasks, vehicle and equipment requirements, materials, and accounting information. The industry commonly uses such units for estimating at this stage. AMRP management adjusts the units used for these preliminary estimates to account for data that may be out of date.

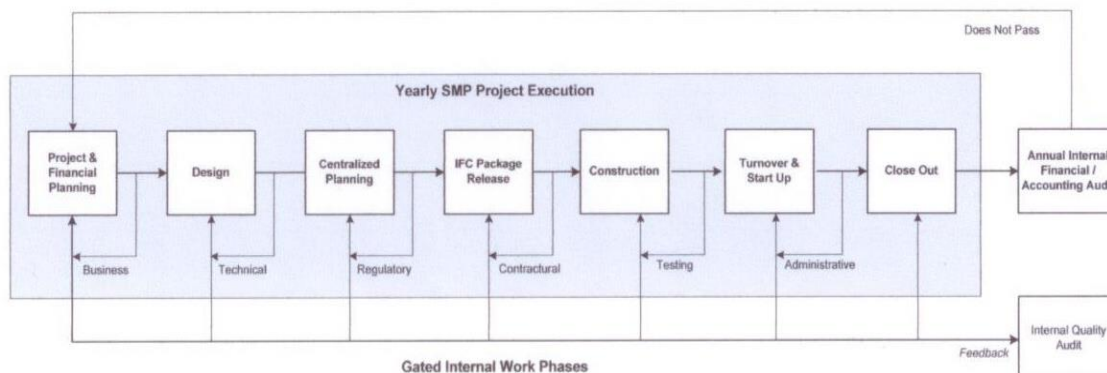
Peoples Gas submits these designs to the City of Chicago’s Office of Underground Construction (“OUC”) for review. This City Department of Transportation, Division of Infrastructure Management entity reviews and approves construction work in or adjacent to the City’s public ways. The City approval process considers clearances from underground facilities, such as sewer, water, and wiring, for example. During City review, Peoples Gas releases the design package for contractor bidding. Following final City approval, AMRP engineering finalizes the WMIS Designs, incorporating any changes resulting from City review. Following contract award, the final project cost estimate is generated. These estimates include contractor costs and the Peoples Gas costs for materials, labor, and overheads. Management then must approve the project design and estimate package prior to construction commencement.

For projects having multiple phases, the AMRP cost manager uses the scope definition for each phase and the project-level cost estimate and schedule. These phase-level products apportion the

quantities from the project-level estimate and use the year set for construction of the phase involved.

The AMRP does not operate under written guidelines or procedures addressing the work management process. The Project Execution Plan (“PEP”), however, contains a diagram that depicts the flow of major work activities. The next diagram illustrates that flow.

**Illustration R.1: AMRP Work Activity Flow**



Liberty found the interfaces and deliverables that need to exist among engineering, centralized planning, supply chains, field operations, shops, contractors, and inspectors clearly laid out. The delineated work activities include a close-out report that issues upon completion of a project. Procedures call for these reports to undergo review for resolution of outstanding issues, rectification of non-conforming items, return of unused materials, resolution of claims or disputes, and contractor performance evaluation. A close-out checklist for each construction work package remains open until sign-off by all responsible supervisors and managers.

The Project Execution Plan also included a number of work-flow maps charting component activities, such the audit process, engineering, centralized planning, construction, start-up, and close out. The AMRP uses a defined series of 25 work steps to chart the activities required to complete AMRP projects successfully. The next table summarizes the description of the activities comprising those steps and the deliverables that each produces.

**Table R.2: Summary of Major AMRP Project Work Activities**

No.	Major Step	Description of Activities	Deliverables
1	Project selection	Analyze to determine high risk main	General project area established
2	Design	Perform Stoner Feasibility and Phasing Design Analysis	Project Scope and Phasing
3	Preliminary Estimate Preparation	Prepared by design engineer	Preliminary Cost Estimate for each Phase
4	Entering Information into WMIS	Support work on tasks of other groups	Completed Business Case Authorization tasks for each Phase
5	Contract bids	Invite and receive bids	Project bids
6	Contract Award	Analyze, recommend, approve bids	Project purchase order
7	Final Cost Estimate Preparation	Prepare estimate; add Peoples Gas costs as a percentage	Final Cost Estimate

8	Authorization - Award	Make formal award per Approval policy	Info in PeopleSoft (tracking authorized level by contractor)
9	Authorization – Final Cost Estimate	Enter estimate for each Capital work order approved per policy	Info in PowerPlan (payment tracking by work/ purchase order)
10	City (OUC) Approval	Submit construction drawings to OUC for approval or resolution	OUC Approved Drawing placed in Work Package
11	Material Acquisition	Send material forecast from Work Asset Mgt. System to Advanced Planning System	Materials received into inventory of warehouse
12	Work Planning	Coordinate with customers to install main and services by contractor	Customer letters requesting appointment to discuss installation
13	Document Control	Release Engineering Work Package (EWP) to Construction planning; permits ordered/ released with materials to contractor	OUC approvals, permits, tickets, installation/retirement drawings, service tie over list, bill of materials
14	Field Planning	Implement Construction Work; coordinate contractors and change orders; resolve installation/ permit problems; resource planning, budget and schedule monitoring	On-going coordination between Peoples and Contractor
15	Construction Scheduling	Maintain main/service construction, gassing mains, meter/regulator installation, service cut-offs, retirement and restoration schedule	Submittal of scheduling requirements by contractors
16	Permitting	Request permits based on engineering; submit permit requests from Shops	Permits to Shops and Document control
17	Material Delivery	Construction planning releases materials to contractors upon request to warehouse	Materials shipped to contractor from warehouse
18	Gas Main Installation	Excavate, install, test, restore gas main, pre and post camera of adjacent main line sewer and laterals all performed by contractors	Installation of gas main per plans
19	Services Installation	Install service per service tie-over list; excavation, installation, testing, restoration, post camera of adjacent main line sewer and laterals all performed by contractors	Services installed per plans and service tie-over list
20	Gassing Mains	Tie-in and Gas main by Peoples Gas, upon satisfactory air-test of main by contractor; restoration of tie-in openings by contractor	Mains gassed by Peoples Gas crews
21	Meter & Regulator Installation	Relocate meters and necessary regulators to outside of building by Peoples Gas crews	All meters relocated to the outside of the building
22	Service Cut-offs	Cut-off old service by Peoples Gas crews once the building has successfully been transferred to the new service	Old building service transferred to new service
23	Restoration	Perform temporary and permanent restorations by contractors per specifications	Restoration by Contractor per City Department of Transportation specifications
24	Inspection	Peoples Gas construction representatives inspect to ensure all restoration complies with current City Department Of Transportation standards	Restoration punch list
25	Close-outs	Sign-off close-out checklist noting construction and base restoration completed, as-built drawings accepted, change orders processed, and punch list items completed	Project close-out checklist



### **b. Work Management Process Improvement**

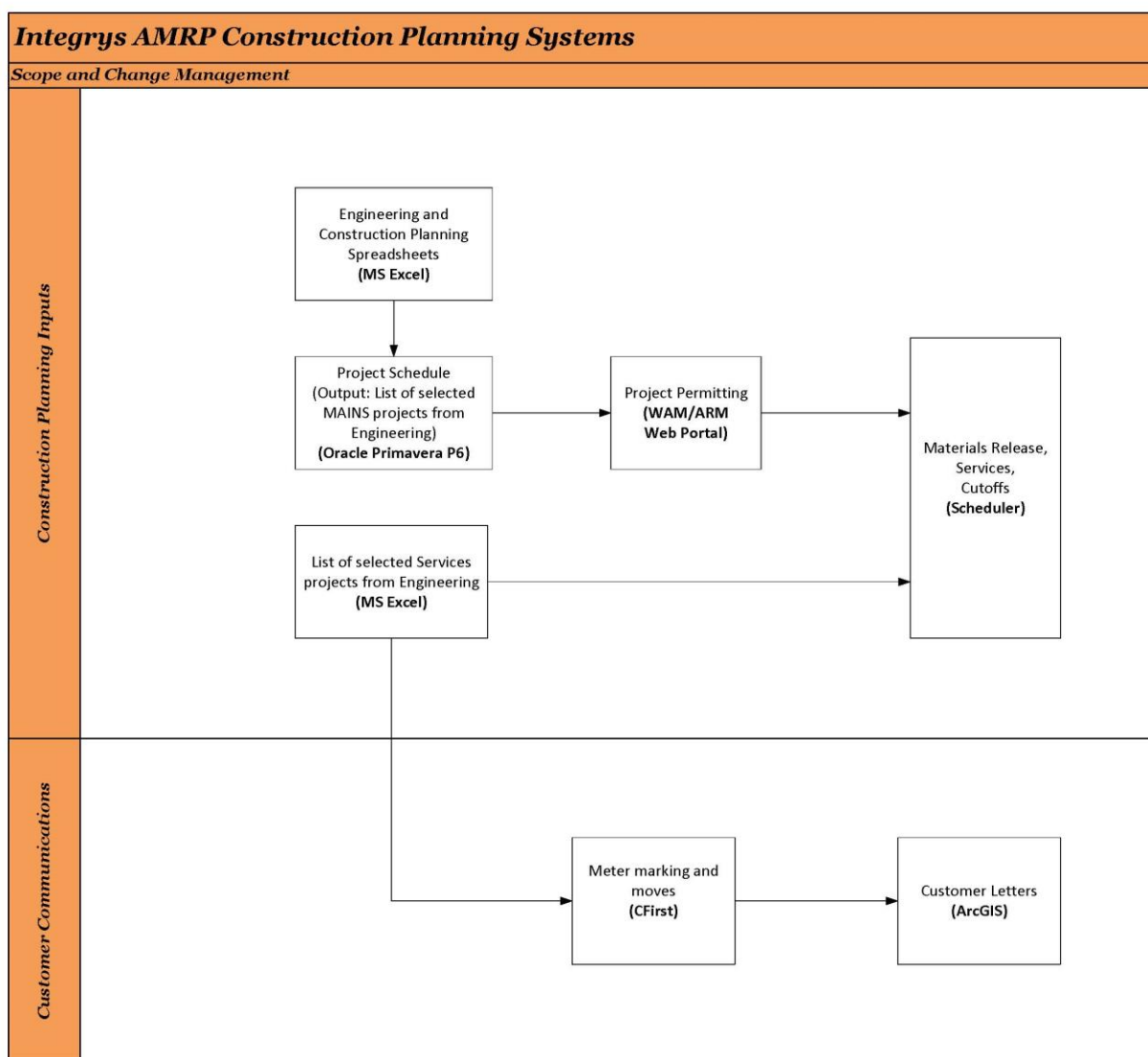
Peoples Gas has undertaken improvement initiatives to enhance the AMRP work management process. These initiatives do not take full advantage of the potential benefits resulting from the scale and duration of the AMRP. They nonetheless demonstrate positive steps to enhance the work management process:

- Adoption of a zonal approach to scheduling internal workforce and contractor crews to reduce travel time and increase productivity
- Development of detailed specifications to standardize all contractor requirements
- Implementation of document management and control
- Development of training requirements for new inspectors and annual refresher training requirements for existing inspectors
- New labor training program established at the City College to expand the labor pool and grow the apprentice program
- Metrics development to monitor performance on safety, cost, and retirement goals
- Quality management system software selected to manage field safety metrics
- Nonconformance reports and Quality Assurance/Quality Control documentation
- Reporting and tracking of construction performance
- Enhanced schedule logic and standard activity structure developed for use on individual projects
- Program work breakdown structure developed and implemented for scheduling
- Quality Assurance Manual and associated quality control procedures developed.

### **c. Work Management Tools**

The next diagram illustrates principal interfaces among AMRP work management tools that address pre-construction and customer communications activities.

### Illustration R.3: AMRP Work Management Tools



The following tools address construction related work:

- The Work Management Information System: used mainly to order materials and manage internal resources
- A SharePoint site: posts construction work packages
- Primavera P6: an industry-accepted tool that AMRP management uses for construction scheduling.

Liberty examined a specific AMRP project in more detail, in order to observe how management actually conducts the work management process. Working at Project Management Office work locations with the Centralized Planning Manager, Liberty walked through the computer screens displaying work management tools and information, discussed key documents in the construction work packages. The walk-through included, for example, valve tickets, approval letters, permits, traffic control plans, engineering drawings, construction schedules, and material lists. Liberty also

visually examined the SharePoint site, which AMRP uses to post construction work packages. Liberty examined how contractors extract construction work packages from the site. The Microsoft SharePoint concept allows organizations to provide a secure place to store, organize, share, and access information from electronic devices, using a web browser.

Liberty also examined work management tools and information for the same project in the field. This examination took place at the Central Shop, working with the Supervisory Engineer at his personal computer. Liberty reviewed the capability to extract construction work package information. The system allows contractors access only to their own awarded projects. Liberty verified the existence of the required release for construction, walked through the traffic plan, and examined the city approval letter, the services plan, and the listing of addresses affected. The information available for the project included the Office of Underground Construction Review records, the various permits, valve tickets, and a summary of the bill of materials, construction drawings, restoration drawings, and retirement drawings. The construction work package appeared comprehensive, and transmission via SharePoint to the Shop appeared effective.

#### **d. Construction Work Packages**

The Document Control group assembles Construction Work Packages (“CWPs”), issues them directly to contractors, and copies them for use by the entire construction team as a source of scope definition. That team includes the Project Management Office, contractors, and the Peoples Gas Shops. These packages get posted on a SharePoint site, accompanied by e-mail transmittal to a set distribution list. Contractors gain access through a separate SharePoint site set up outside the corporate firewall. The AMRP Construction Planning group manages all permitting activities. These activities include requests for and tracking of all permit requests, expirations, and renewals. All work requiring Illinois Department of Transportation (IDOT) permits must have traffic control plans. Engineering consultants prepare them for review by People Gas. Requests for these include Company-approved traffic control plans.

The construction work package contains drawings, valve tickets, corrosion tickets, approval letter from the city, traffic control plan, material lists, and constructions schedules. Document Control staff uploads the whole package to a SharePoint site that all authorized work groups, including the contractor selected, can access.

Liberty examined a project Construction Work Package for content. This package included the expected documentation:

- Engineering Summary
- City Office of Underground Construction - Approval letter with attachments
- Redflex Traffic Systems drawing – Traffic Control Plan for Cicero at Addison corner
- Summary Bill of Materials
- Permit by activity
- Service tie-over list at Portage Park Phase 4
- Valve tickets – Type D installation
- Restoration drawings
- Installation drawings
- Retirement drawings.

#### **e. Construction Work Management**

The Peoples Gas Shops managed their budgets at the project level by work hours. The Shops determine the work hours on the basis of the level of effort associated with main and service installation. Contractors provide detailed schedules for main and service installation. The Project Management Office scheduling group works with the Shop construction managers to identify and establish the interface requirements for Shop activities. The contractor and master project schedules address those interfaces. Contractors cannot complete their work until they finish restoration activities that follow the back-end work performed by Peoples Gas crews. The Project Management Office scheduling group and the Peoples Gas shops currently work together to begin resource loading the schedules. These loadings should assist in verifying that Peoples Gas can meet total resource requirements (and allocate them effectively) for performing their portions of AMRP work.

Peoples Gas distribution crews make the tie-ins to gassed mains after contractors have installed and tested new main and service installations. Main gang crews may need to cut out an existing main to install a tie-in piece or make a hot tap into the energized main. These crews use different methods, depending upon the type of existing main (plastic, for example). Main gang crews also have responsibility for the abandonment of old mains. Abandonment occurs after verifying the transfer of all services to the new main.

Peoples Gas distribution and service crews also conduct the activities associated with relocating meters. The relocation process involves internally plugging the existing low pressure service when possible. Otherwise, the crews make a physical cut on the exterior of the premises via an excavation. After plugging or cutting the existing low pressure service, Peoples Gas crews install new meters and regulators, and then relight appliances.

Management of these Peoples Gas work processes takes a number of forms, supported by daily communication among Shop supervisors, construction managers, and contractors. Daily updates to Shop databases identify services installed and ready for transfer, main amounts being installed, and the time horizon across which Peoples Gas can reliably predict requirements for energizing new main segments.

#### **f. Support from Other Work Groups**

Many work groups support AMRP work. The next table summarizes the major functions of these groups. Some of them operate through resources not dedicated full time to the AMRP.

**Table R.4: AMRP Support Group Functions**

Other Work Group	Major Functions
Engineering/Planning	Identify and plan work; develop master plans
Engineering/Design	Prepare / update the gas (Stoner) model and drawings; conduct design and constructability reviews; obtain Chicago OUC approval; define Construction Work Packages / prepare contents; review and input as-built drawings into model
Procurement	Purchase materials; manage contract bidding and award process
Construction Planning	Schedule and obtain permits from city and state; send out customer letters; coordinate conflicts with the city and other utilities
Document Management	Assemble all Construction Work Packages; control all documents between the AMRP and contractors
Shops	Mark and set meters; provide all services for live gas (retire mains); coordinate construction sequencing with contractors; coordinate field issues and logistics; manage construction tie-in and test mains
Scheduling	Plan, schedule and coordinate work between engineering, construction planning, contractors and shops
Cost Management	Develop, and manage budgets; forecast costs
Contract Management	Manage the Notice to Proceed, Request for Information and change management processes; manage contract details
Field Inspectors	Inspect contractor work to ensure compliance with specifications
Restoration Mgt.	Ensure that restoration is completed per schedule
Close-out	Verify job and paperwork completion prior to final payment release
Communications	Coordinate and provide liaison between Peoples Gas and the community and within Peoples Gas between major functional groups
Government Affairs	Develop relationships and communications with city and state
Safety	Provide safety leadership and reporting; advance safety as a way of life for all AMRP participants as realized in reduced safety incidents
Quality	Ensure that the program / projects are executed in compliance with procedures, plans, and functional practices

The AMRP Engineering Supervisor believes that design engineers have provided adequate technical support to the field during construction. Liberty observed, however, that a number of unfilled positions exist in the engineering resources dedicated to AMRP. One cause of vacancies comes from the Company's engineer rotation program. This program creates periods of shortages pending replacement of engineers departing for rotation purposes. The Engineering Supervisor did not express confidence that the Company could fully staff AMRP engineering over the program's long term.

The Compliance Monitoring Group Lead, an employee of the Integrys Business Support organization, oversees the AMRP Quality Assurance/Quality Control program. This Lead also has responsibility for construction in other Integrys areas of operation. Auditor qualifications include one to six years in gas operations and one to six years in field supervision. The current audit target requirement is to audit one contractor per quarter. Tasks covered by these audits include gas main replacement, service installation, anode installation on cathodic protection, and directional boring. A computerized data base houses records associated with auditing. The database identifies audit types and activity levels, and includes a 15-question checklist. Auditors generate deficiency reports when they find unacceptable conditions or circumstances. Contractors then have five to seven days to rectify problems found. The auditing program has not found any major, recurring issues.

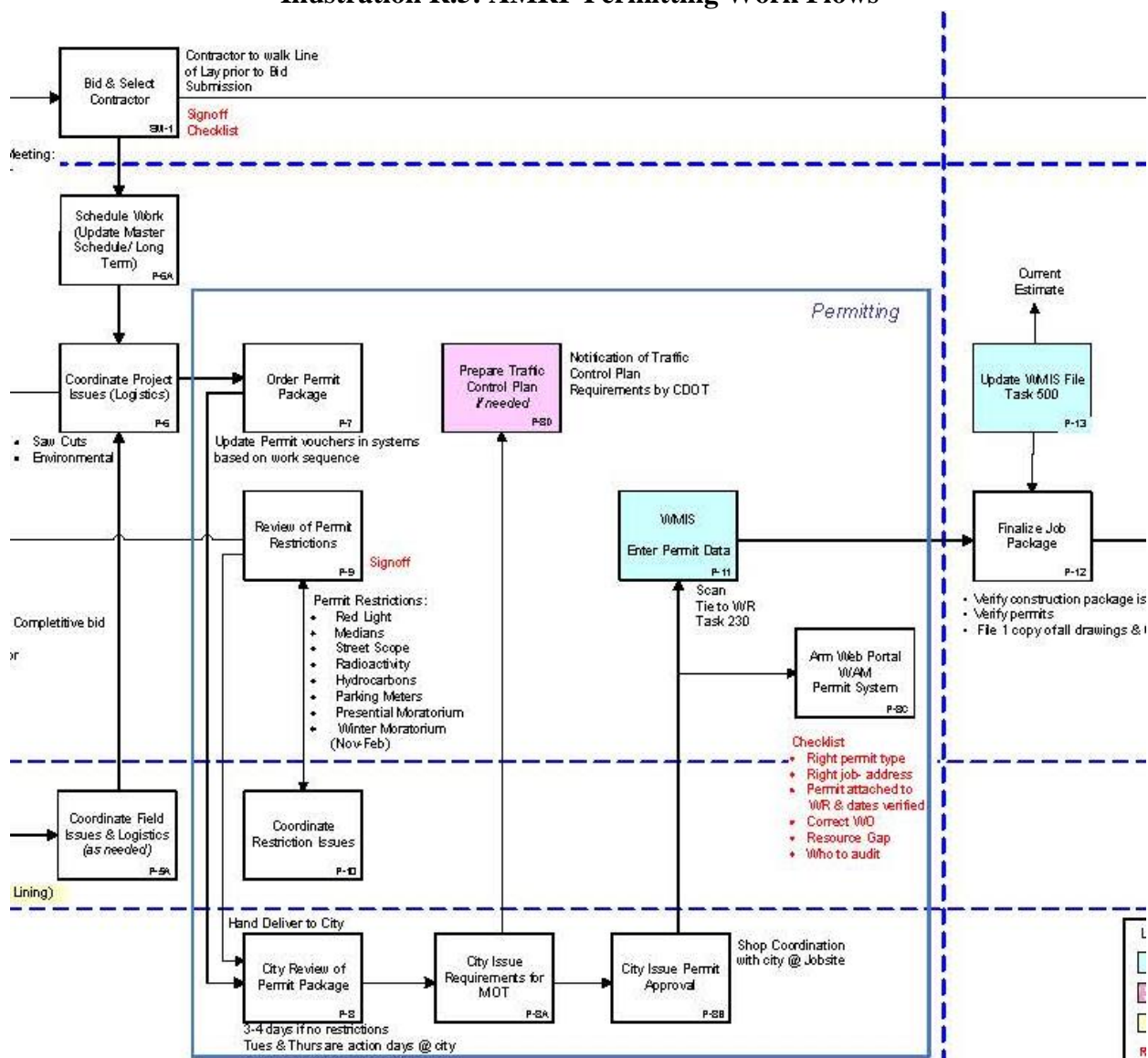
The Lead Inspector, a position filled by a Jacobs Engineering person, has responsibility for inspecting contractor AMRP work. The current inspector team has 19 members. The team, however, currently lacks people in 16 approved, but open positions. Each inspector undergoes a training plan that includes two weeks of field shadowing and two months of classroom work. The class work addresses Peoples Gas procedures; *e.g.*, as as-built drawing accuracy verification, fusion, and work orders. These inspectors only examine contractor work on main and service installations. The AMRP targets one inspector per crew. Crews generally consist of six to eight workers. Jacobs Engineering has responsibility for advertising and recruiting of needed inspectors. Retired Peoples Gas craftsmen (with 25 to 30 years of experience) make up most of the contractor inspection force.

The Lead Inspector believes a large pool of potential resources obviates any concern about resource availability. Liberty inquired about the large number of inspector vacancies, given this view about the ample number of resources available to fill positions. The reason was not clear.

#### **g. Permit Coordination**

Generally speaking, the AMRP work management process has proven supportive of getting work done in the field. Permit issues, discussed more fully in this report's Chapter S: Safety and Compliance, however, have caused significant schedule delays, and have produced work inefficiency. The next diagram (from the Project Execution Plan) highlights the complexity of permitting work activities.

Illustration R.5: AMRP Permitting Work Flows



### 3. Conclusions

#### R.1 The AMRP work management program appropriately supports construction work.

Peoples Gas employs a reasonably comprehensive work management process that employs sound work management tools. The work packages provide adequate information for construction contractors and internal Peoples Gas crews. This report's Chapter E: Plan for Management addresses the lack of assignment of project managers to many individual AMRP projects. The lack of assignment of a project manager for each project leaves no dedicated responsibility and accountability for managing performance from project inception to completion. Engineering has charge of the project work flow until construction takes it over. Significant project issues are at risk of going unaddressed as a result. Use of a project manager at the project level (as recommended in Chapter E) would provide a clear source for recognizing and addressing risks early. Permit coordination programs offer an example of such risks that have posed material

consequence for AMRP cost and schedule. Evaluation of contractor performance comprises another example. Liberty learned that management has undertaken no such evaluation for a number of years. The Supply Chain organization performed an older evaluation, but reports that responsibility for doing so now resides with Construction Management.

**R.2 Peoples Gas has implemented some improvements to work management practices, which focus on construction, but has not captured all opportunities for gaining efficiency in performing repetitive AMRP activities. (*Recommendation R.1*)**

To take advantage of the long duration and repetitive nature of AMRP work, management needs to focus on opportunities to increase productivity in the installation of mains, services, and meters, which comprise the three largest components of overall costs. This report's Chapter I: Resource Planning addresses productivity monitoring. Moving past the construction ramp-up period and informed by experience to date, Peoples Gas should be at the point of producing close to maximum installation efficiency. For instance, Liberty expected the unit rate of work-hours per meter installed by the internal workforce would show improvement (*i.e.*, reduction). Likewise, the unit cost of main installation and service installation should lower, or at least remain flat. Failure to monitor such rates, however, precludes a clear understanding of the direction of such rates over time. The Company needs to accompany improvements in monitoring such rates with efforts to examine the potential for process improvements that will produce efficiency gains.

**R.3 The AMRP lacks designated project controls engineers that the program needs to support program managers. (*Recommendation R.2*)**

Managers have the responsibility to manage work effectively and efficiently. They possess varying degrees of skills, based on their education and experience. Some managers devise their own tools and some do not. The AMRP needs a consistent set of tools routinely applied to support program management effectively. The AMRP also needs capable engineers and analysts to examine costs and to identify potential areas of improvement in effectiveness and efficiency. This report's Chapter L: Cost Management addresses this same need from the cost monitoring and analysis perspective. Its relevance in this context comes from the need for the use of cost data to support work management changes. Control engineers or cost analysts who examine cost data can assist construction management in developing metrics and performing analysis designed to highlight ways to better define and manage field work activities. This report's Chapter O: Reports and Analysis discusses the potential for using existing resources to assist in performing cost analytical functions not currently performed.

**R.4 Permit coordination adversely affected progress in the field and imposed cost inefficiencies. (*Recommendation R.3*)**

The AMRP Monthly Status Report contains a schedule section that summarizes schedule variances. The 2014 year-end report listed almost 80 percent of project phases as behind schedule. Many of these delays cited permit issues or still pending approvals from the City's Office of Underground Construction as the cause. Schedule delays generally produce cost increases.



## 4. Recommendations

### **R.1 Peoples Gas should establish a formal continuous improvement program under the Impact Team to promote a culture of and an emphasis on seeking innovations to improve efficiency in the installation of mains, services, and meters. (Conclusion R.2)**

A Company-established Impact Team that has been examining AMRP performance for some time generated a number of initiatives. Most have Integrys-wide application. This team, or a successor identified by new AMRP leadership, should focus more specifically on improvement opportunities created by the highly repetitive nature and the long duration of AMRP construction work (specifically with respect to main, service, and meter installations). Employees working on the AMRP likely form a primary, if not the most likely, source of identification of improvement initiatives. A formal continuous improvement program, complete with emphasis on quantifying costs and benefits will promote a cost awareness culture, and improve efficiency on an on-going basis.

### **R.2 Peoples Gas should assign a project control engineer or cost analyst to each of the three Shops to handle the analysis of all AMRP construction work performed by the internal workforce and contractors. (Conclusion R.3)**

Two other chapters of this report (Chapter L: Cost Management and Chapter O: Reports and Analysis) discuss the importance of equipping managers with the analytical capability and resources to support effective management. Some Peoples Gas engineers and cost professionals have skills suitable for performing this role. Management should combine existing skilled personnel and added resources to address the needs discussed in those other two chapters. These resources should also focus specifically on work processes, seeking to identify improvements that will enhance effectiveness and efficiency. Liberty recommends the assignment of one project control engineer or cost analyst per Shop to handle the analysis of AMRP construction work performed by internal workforce and contractors. The Company can matrix them to the cost management organization recommended in this report's Chapter L: Cost Management. A matrix approach will allow them to develop skills and consistency of approach through the cost management organization, while taking advantage of construction work knowledge in the Shops.

### **R.3 Peoples Gas should assign a single manager to coordinate AMRP-level permitting improvement initiatives and to monitor and measure permitting for the duration of the program. (Conclusion R.4)**

Liberty made recommendations regarding permit coordination in this report's Chapter S: Safety and Compliance. That chapter addressed improving communications with the City, reorganizing the External Affairs organization, creating a function dedicated to liaison with the City, improving performance, enhancing project planning, developing a database for permit applications, and integrating permitting into project scheduling. To ensure that these improvement needs get proper and timely attention, the AMRP team should assign at a senior program management level the responsibility to implement needed changes, and then to continue to resolve any permit coordination problems.

## *Chapter S Table of Contents*

Chapter S: Safety and Compliance .....	S-1
1. Background .....	S-1
2. Findings.....	S-1
a. Safety .....	S-1
b. Federal OSHA and Environmental Compliance.....	S-6
c. Actions to Address the Causes of Violations.....	S-7
d. Field Investigations.....	S-9
3. Conclusions.....	S-9
4. Recommendations.....	S-10

## Chapter S: Safety and Compliance

### 1. Background

This chapter reviews safety violations of Illinois and Federal regulations from the beginning of 2012 through the middle of 2014. The chapter also describes the corrective actions taken. Liberty conducted this review to determine baseline conditions associated generally with the performance of work subject to minimum safety standards established by the State of Illinois and the U.S. Government. The review also focused on compliance with requirements more directly associated with the AMRP. The City of Chicago is the primary source of such requirements. Compliance with requirements is essential for the effective performance of a program such as the AMRP. Liberty sought to determine whether the recent violations history demonstrates any recurring or systemic problems that have had or that may have a substantial impact on the efficiency, effectiveness, or safety with of AMRP work.

The field investigation work that Liberty undertook as part of this investigation also has a close connection with matters of public safety. This chapter discusses some of the safety and compliance issues observed during those field investigations. Chapter Q: Field Work Performance addresses those investigations and their findings in detail.

A particular safety focus here concerns notices of violations received by Peoples Gas from responsible government authorities. Inquiries with respect to such violations included:

- Reviewing safety audits and violations of 49 CFR 192 over the last two years
- Reviewing corrective action reports and other documents relating to prior safety violations
- Reviewing incident reports for root causes that may involve safety violations
- Evaluation of compliance procedures and policies
- Interviewing and observing Company and contractor field personnel
- Integrating reported incidents and safety audits findings to identify any recurring or systemic issues.

### 2. Findings

#### a. Safety

Ensuring public and worker safety at work sites must be a first priority for the AMRP. Liberty's field examinations (discussed in more detail in Chapter Q: Field Work Performance) considered safety. Controlling traffic effectively keeps rights-of-way as clear as possible for the traveling public. Traffic control also ensures motorist and pedestrian safety. Liberty's field inspections found traffic control effective. Chapter T: Government Coordination addresses City relationship issues involving traffic control. Public and employee safety comprise first priorities in the performance of AMRP work and in the operation of gas systems.

Worker accident rates among Peoples Gas employees performing AMRP field work have exceeded those of contractors. This result reflects a reversal from what Liberty has seen elsewhere for field work in the gas distribution business. A 2008 Liberty audit for the Illinois Commerce Commission identified upper management focus on promoting and ensuring safety as an issue. Work on this investigation confirms a continuing need for senior leadership and for AMRP

management to communicate a strong commitment to safety. Liberty's field investigation work disclosed instances and conditions that implicate safe work practices and conditions. The Company has made progress in recent years to reduce the number and the severity of these accidents, but their rates continue to raise concern.

The next tables list 2012 through mid-2014 safety notices occurring in the City of Chicago. It does not include violations related to storage or to liquefied natural gas. The section references are to 49 CFR 192 ("Transportation of Natural Gas and Other Gas by Pipeline: Minimum Federal Safety Standards"). The notices consist of three types:

- Notices of Amendment (Company procedures require amendment to meet minimum state or federal requirements)
- Notices of Probable Violations (subject to agreement by the Company or administrative resolution if contested)
- Inspection Issues (noted by Illinois Commerce Commission inspectors during inspections of field work or records).

**Table S.1: Pipeline Safety Notices and Inspection Issues**

*Notices of Amendment*

Date	Violation	Section	Closed
<b>2012</b>			
2/21/12	DIMP Master Meter Implementation	192.1005	5/14/12
2/23/12	Test requirements below 100 psi	192.509a	6/20/12
4/10/12	Purging of pipelines	192.629e	7/27/12
7/25/12	Public awareness	192.616c	11/20/12
<b>2013</b>			
6/5/13	Control Room Management	192.631c2	1/2/14
6/5/13	Control Room Management	192.631b4	
6/5/13	Control Room Management	192.631b3	1/2/14
6/5/13	Control Room Management	192.631b1	1/2/14
8/22/13	O&M Manual	192.605a	12/27/13
<b>2014</b>			
1/23/14	O&M Manual	192.605b3	6/17/14
1/31/14	O&M Manual	192.605a	6/2/14
1/31/14	O&M Manual	192.605a	6/2/14
5/15/14	General Requirements for Pipelines	192.13c	

*Notices of Probable Violation*

Date	Violation	Section	Closed
<b>2012</b>			
1/10/12	Electrical isolation	192.467d	7/9/12
1/10/12	Test requirements for reinstating service lines	192.725a, b	7/9/12
1/31/12	Plastic pipe, qualifying people to make joints	192.285	2/6/13
3/6/12	Emergency Plans	192.615c	7/8/13
2/23/12	Test requirements for plastic pipe	192.513	7/9/12
2/23/12	Customer notification	192.16b,c	3/14/13
2/23/12	Test requirements for reinstating plastic lines	192.725	7/9/12
3/15/12	Public awareness	192.616	7/9/12
7/26/12	Reporting safety related conditions	191.23a1	12/20/12
9/13/12	General – Maintenance	192.703c	11/26/12
9/13/12	O&M Manual	192.605a	12/17/12

11/28/12	General - Operations	192.603b	2/1/13
2013			
2/19/13	General – Maintenance	192.703b	
2/19/13	Emergency Plans	192.615a	
3/14/13	Records – Tests	192.517b	4/29/13
8/22/13	O&M Manual	192.605a	1/3/14
8/27/13	O&M Manual	192.605a	10/21/13
10/17/13	O&M Manual	192.605a	1/3/14
2014			
6/16/14	External Corrosion Monitoring	192.465a	

*Inspection issues*

Date	Violation	Section	Closed
2012			
3/19/12	Customer meters and regulators: Protection from damage	192.355	12/23/13
3/19/12	Recordkeeping	192.807	12/23/13
3/19/12	Plastic pipe: Qualifying persons to make joints	192.285	3/10/14
3/19/12	General - Operations	192.503	12/23/13
4/10/12	Customer meters and regulators: Location	192.353	7/9/14
4/12/12	192.603(b) - General provisions		1/28/14
4/10/12	Excess flow valve installation	192.383b	12/23/13
4/12/12	General - Maintenance	192.603b	1/28/14
4/12/12	General - Maintenance	192.603b	1/28/14
4/10/12	Damage prevention program	192.614c5	1/28/14
4/19/12	Damage prevention program	192.614	1/28/14
4/19/12	Damage prevention program	192.614	1/28/14
8/7/12	Purging of pipelines	192.629a	12/23/13
10/3/12	Inspection of materials	192.307	12/23/13
2013			
9/5/13	O&M Manual	192.605b8	
10/8/13	Line Markers	192.707a1	7/9/14
2014			
1/30/14	General - Test	192.703a	4/11/14
1/30/14	Plastic pipe: Qualifying persons to make joints	192.285d	
3/13/14	External corrosion control: Test leads	192.471a	6/12/14
3/13/14	Damage prevention program	192.614a	6/13/14
3/19/14	Distribution system: Annual report	191.11a	6/9/14
5/28/14	General requirements – Testing	192.503d	
6/11/14	General provisions - Operations	192.603b	
6/11/14	Pressure limiting and regulating stations: Capacity of relief devices	192.743a	
6/11/14	Pressure limiting and regulating stations: Inspection and testing	192.739a	
6/10/14	General provisions - Operations	192.603b	
6/12/14	Marking of materials	192.63a	

*i. City of Chicago Permit Compliance*

Liberty examined compliance with City of Chicago permitting requirements. The following tables summarize issues arising under those requirements. The number of Chicago permit violations rose from 658 in 2012 to 807 in 2013. The violations include both AMRP and other work. The 2013 violations include 250 resulting from AMRP work. Peoples Gas did not separately identify AMRP violations prior to 2013. The largest violation causes in 2012 consisted of permitting issues (424 cases of no permitting or failure to report openings), with the second largest causes relating to

restoration (73 cases). Main and service installations require substantial surface restoration work. City permits subject restoration work to substantive requirements and time limitations. For 2013, the principal causes remained the same. Permitting issues (unreported openings, lack of permits, failure to extend permits, incorrect locations) accounted for more than 300 of the 807 violations. Restoration issues (untimely or failing to meet permit standards) accounted for a number approaching 200.

**Table S.2: 2012 City of Chicago Permit Issues**

<b>Root Cause</b>	<b>No.</b>
Contractor repair untimely	18
Contractor received work late	56
Street/sidewalk obstructed	0
No plating/barricades	13
Plating/barricades not secured	8
No permit	170
No permit (B-Box)	0
Working outside of permit	0
Unauthorized closing of street	0
Prior years related (lost)	0
Opening below grade (OBG)	0
Opening not reported	254
Structure failure	0
Street not striped	0
Weather not permitting restoration	0
CBD exception	0
Unsatisfactory restoration	10
Failed to restore sidewalk to CDOT Standards	14
Failed to restore street to CDOT standards	49
Obstructing public way	5
Failing to sawcut before restoring to CDOT Standards	2
Failed to restore opening within 5 days of permit	1
Failed to provide barricade for opening	3
Violated permit terms - incorrect permit	3
Failure to cover manhole	1
Placed equipment in "paid to park" zone without restrict stated in permit	3
Violation of permit - stored material in parkway	2
No permit & failure to restore street to CDOT Standards	4
Failure to plate opening securely	1
Failed to thermoplastic stripe pavement	11
Damaged curb during street excavation	1
Failed to secure plate	3
Slow manual process	24
No restoration agreement	1
Failed to remove plate	1
Total	658
AMRP caused	?

**Table S.3: 2013 City of Chicago Permitting Issues**

Root Cause	No.
Contractor restoration failed	1
Failed to concrete base opening	7
Failed to maintain non-telecommunication utility access	1
Contractor received work late	9
Contractor restoration untimely	24
Damaged curb during street excavation	0
Failed to plate opening	7
Failed to provide barricade for opening	4
Failed to remove plate	1
Failed to restore basin box	1
Failed to restore opening within 5 days of permit	3
Failed to restore sidewalk to CDOT standards	53
Failed to restore street to CDOT standards	92
Failed to secure plate	18
Failed to stripe pedestrian walkway	1
Failed to thermoplastic stripe pavement	33
Failing to saw-cut before restoring to CDOT Standards	5
Failure to cover manhole	0
Failure to extend permit	30
Failure to maintain street opening to grade	8
Failure to plate opening securely	1
Failure to post sidewalk closing sign & no Company telephone number	6
Failure to secure plate	4
Failure to secure plate & failure to plate opening	1
Material left in street after 5 days of completion of work	2
Grinded not topped due to asphalt plants not open	1
No permit	43
No permit & failure to restore sidewalk to CDOT standards	2
No permit & failure to restore street to CDOT standards	5
No permit on site	3
No permit and failure to sawcut opening	2
Opening bigger then permit states	5
No plate & materials stored in parkway	1
Obstructing public way	15
Opening not reported	231
Placed equipment in "paid to park" zone without restrict stated in permit	1
Permit did not state street openings were going to be made	8
Paving inspector inspected untimely	1
Street cut 1' 1/2' below grade	1
Permit does not state correct location	23
Old opening	5
Manhole below grade	1
Slow manual process	78
System error, RSTIN not complete	1
Violated permit terms incorrect permit	6
Missing valve cover	1

Violation of permit stored material	7
Shared Opening	1
Failure to restore parkway to CDOT Standards	2
Violation of permit terms	13
No inspection created	3
Corrosion core openings	2
Other's opening	1
Failure to remove barricades	1
No stamp in concrete	1
Failed to amend permit for restoration	2
Failed to saw-cut and post signs	1
Failed to maintain parkway opening to grade	1
Failure to post "Sidewalk Closed" signs	1
More openings than permit states	7
No restoration agreement signed for moratorium street	2
Vehicle drove over curb	1
Did not maintain safe temporary restoration of ADA	3
Failure to restore ADA to CDOT standards	1
Slow permitting process	5
Failure to utilize 150' rule	1
Construction debris left, No workers present	2
Work not scheduled or completed in WIMIS	4
TOTALS	807
AMRP CAUSED	250

#### b. Federal OSHA and Environmental Compliance

The next table summarizes recent-year citations from the U.S. Occupational Health and Safety Administration. Their number and the lack of recurrence recently indicate that they do not reflect current systemic or recurring problems.

**Table S.4: OSHA Citations**

Date	Citation	Reason	Agency	Status	Pending Actions
8/25/2010	3.14E+08	No shoring. No cave in protection. Repeat downgraded to Serious with fines of \$20,000. Competent person allowed person to work in the opening. Serious downgraded to None with no fine.	OSHA	Closed	Issued 11/18/2010
1/20/2011	3.15E+08	Employees working in roadway without advance warning signs and one lane road sign. Initially issued as Serious but downgraded to Other Than Serious \$3,700.	OSHA	Closed	
4/13/2011	3.15E+08	Shoring Materials, discolored, etc. Serious 1 Citation, items 1a, 1b, 2a, and 2b. Fines in the amount of \$8,800.	OSHA	Closed	All citations vacated



7/23/2012	551758	PGL Central District. Citation 1: Lack of Tabulated data on site, Serious, \$3,300. Citation 2: Improper installation of shoring, Repeat, \$38,500.	OSHA	Closed	Settled at informal conference 9/28/12. Citation 1: Reduced to Other Than Serious, penalty eliminated. Citation 2: Reduced to Serious, penalty reduced to \$15,000.
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### c. Actions to Address the Causes of Violations

Violations cannot be completely eliminated on a gas distribution system of the size and nature of the one that Peoples Gas operates in the City of Chicago. Effective management nevertheless requires programs, actions, and performance measurement designed to minimize violations. Good utility practice requires a program for identifying the root causes of recurring problems and for addressing them promptly and effectively. Liberty's review included an examination of how AMRP management addresses such problems in planning, managing, and executing work.

Permit compliance problems and late or poor quality restoration have caused the bulk of City permit violations. Chapter T: Government Coordination discusses coordination with the City to address issues associated with securing proper permits and with managing overall relationships with the City as they concern the AMRP.

Discussions with the City have led to some changes to address the matter of permit violations. One such change involves the addition of specific restoration inspectors in each of the three, geographically based Shop areas into which Peoples Gas divided its field organizations. The North shop added contractor resources to perform restoration work on a 14-day schedule. Peoples Gas also stopped using a restoration contractor whose poor work had caused numerous violations. Peoples Gas encouraged contractors unable to handle main and service installations and restoration to subcontract some restoration work. This approach added to resources available to handle restoration within applicable time limits.

The changes have positioned Peoples Gas to make improvements in the speed and quality of its restoration efforts following main and service installations. Decreasing the time for completing restoration activities, however, causes indirect and adverse effects. Peoples Gas crews perform back-end work that follows the gas main and installation performed by contractors. The Company crews have had continuing problems in completing meter placement and tie-in work following main and service installations. To the extent that restoration promptly follows main and service installation, late meter placements and tie-ins cause added restoration work. More promptly performing installation restoration thus increases the inefficiencies that late meter placement and tie-in produce.

The number and variety of pipeline safety infractions (which include notices of amendments, inspection issues, and violations) encountered led to the re-institution in 2013 of a self-reporting letter from Peoples Gas to the Illinois Commerce Commission. This change reflects best practice. This letter addresses: (a) the violations that the Company deems to have occurred in each quarter, (b) the Company's observed reasons for each violation, and (c) corrective actions to prevent reoccurrence. Liberty observed that self-reported infractions and those found by the Illinois Commerce Commission show a slight reduction in numbers. Nevertheless, many of the same types of issues continue to appear.

Examples include missed valve inspections, incomplete or missed leaks or leak rechecks, among others of concern under the pipeline safety regulations. Examinations by Liberty in a 2008 audit for the Illinois Commerce Commission identified valve inspections as an issue. Valve documentation problems continue today. Untimely reporting of new valve installations and incorporation of as-built information into system maps provide examples.

Chapter Q: Field Work Performance describes the field inspections Liberty undertook as part of this investigation. Liberty had field inspectors in the area when an incident caused injury to two Peoples Gas employees. The incident occurred during a gas main re-pressurization. The end cap/coupling blew out due to pressure. A somewhat similar incident in 2010 caused a Company employee fatality.

Another recent incident led to increased requirements when the Company seeks to employ directional drilling (“HDD”) for installing mains and services. It cross-bored (put a gas pipe through) a sewer. Directional drilling makes use of a boring machine to make a hole through which the main or gas service can be pulled. Bores can range in length from 20 feet to thousands of feet. When other underground facilities are present, care must be taken to avoid their location, or to go under them with sufficient clearance to avoid damage. Some companies using best practices not only perform location and marking work, but also use test holes to locate physically the other facilities. Until recently, Peoples Gas did not use test holes.

Peoples Gas agreed to a settlement (see ICC Case 12-0624) regarding a citation for failing to address the possible presence of sewer laterals when performing directional drilling. The settlement produced a fine. The Company also made significant procedural changes when using directional drilling for AMRP work. Crews must now first locate all sewer mains and laterals, use an inserted TV camera to confirm the location, make test holes to refine location, and document the information learned. Following installation, but before activation of the main (*i.e.* gas-in), the Company must video tape the sewer main and laterals to confirm that none have been affected by the gas replacement work. The Company keeps these video tapes to verify no damage to the sewers or laterals during main and service installation.

The federal OSHA violations mainly addressed shoring issues that Peoples Gas appears to have addressed.

Other data Liberty reviewed confirms the existence of continuing safety issues. A comparison of overall worker safety over the course of the AMRP shows acceptable results. However, it has taken exceptionally strong performance by contractor resources to overcome substandard performance by Company employees. Contractor numbers produce good overall results. Some improvement has occurred, but employee safety still falls below targets. This report’s Chapter Q: Field Work Performance addresses management issues underlying employee safety performance.

In addition, the number of leaks being reported and the number and wide variety of self-reported safety violations since 2013 cause concern. The small decrease in the number of violations shows some improvement. The fact that the violations reported each quarter show some of the same causes raises concern, however. The concern surrounds the sufficiency of efforts to address

recurring root causes. The Company only recently instituted a program of formal root cause analysis. Such programs have comprised an integral element of good utility practice for some time.

Safety programs exist at Peoples Gas, but effective control of safety performance requires strong and direct upper management engagement.

#### **d. Field Investigations**

A number of the findings resulting from Liberty's field inspections of AMRP work bear directly on compliance with requirements. Liberty's inspection work covered all three of the Peoples Gas Shops into which the Company divided its field operations. Chapter Q describes these inspections fully.

Their observations disclosed a number of contributors to safety and permit noncompliance and to work performance problems. Many, but not all, focused on work performed by Company employees, rather than contractors. These underlying causes have contributed to: incidents creating public safety risks, observed code non-compliance instances, lost-time Peoples Gas employee accidents, and installation efficiency loss.

### **3. Conclusions**

#### **S.1 The number and the severity of the past violations and continuing self-reporting violations indicate a need for management to increase emphasis on compliance with requirements as an integral element of work performance. (*Recommendation S.1*)**

Liberty's work for the Illinois Commerce Commission some five years ago raised concerns about upper management's focus on public safety. The emphasis that management places on instilling an aggressive commitment to safety remains an issue. Certainly, the scope and magnitude of AMRP work brings greater occasion for safety violations and incidents. That change, however, serves only to increase the importance that the Company must place and continue to emphasize regarding public and worker safety. The number and nature of Illinois Commerce Commission safety inspection items and self-reported violations show a continuing need for improvement. The reported violation data and the observation of Liberty's field investigation team merit a re-examination of the approach and programs that assure public and worker safety.

Upper management cites safety as its highest priority. The challenge comes in making that commitment an ingrained and central aspect of work planning, execution, and measurement. Experience to date demonstrates a more reactive than proactive approach to meeting that challenge. Liberty's review of compliance with state and city regulatory requirements (pipeline safety codes in 49 CFR Part 192, related state regulations, and Chicago permit requirements) indicates that Company actions appear driven at least as much by outside forces, as by internal direction. Liberty did not find imminent threats to public or employee safety. It nevertheless remains the case that Peoples Gas needs a stronger source of internal direction to improve its safety performance.

Over an extended number of years, Peoples Gas has paid fines and has undergone audits performed both by Company-retained outside firms, and by others working on behalf of regulatory authorities. There have been instances of incomplete response to the conclusions of examinations

of various sorts, until outside authorities have taken strong actions. For example, the City of Chicago stopped construction permits Companywide, pending compliance with certain provisions, such as prompt completion of required restoration work. There have been positive responses to such outside forces, but it remains critical that Peoples Gas strengthen leadership, direction, communication, design, execution, and performance measurement. These actions will confirm that commitments to compliance drive principally from internal values and objectives.

**S.2 The Peoples Gas employee accident rates on AMRP work exceed those of contractor personnel, and require an increased focus on safety. (*Recommendation S.2*)**

An outside reviewer (PwC) also observed a lack of definition of and approved processes for quality management. PwC also observed that, while the safety program conformed to industry standards, its results did not meet expectations. Historical worker safety performance by Peoples Gas personnel has fallen significantly below that of AMRP contract resources, and significantly below the goals established for the program. Only exceptional (by comparison) contractor performance has served to keep overall safety performance at expected levels.

## **4. Recommendations**

**S.1 Peoples Gas should invigorate its commitment to safety and permit compliance through designation of an executive level “champion,” and institute a comprehensive communications program, set aggressive goals and performance targets, perform regular measurement, perform root cause analysis, and develop responsive action plans. (*Conclusion S.1*)**

Integritys and Peoples Gas resources both must contribute to produce effective safety performance and compliance with permit requirements. The parent has engaged in a number of efforts to standardize operations across its entities. Liberty was unable to find a single, senior-level person responsible for championing AMRP safety and compliance. Increasing the focus on such performance through designating an executive lead with specific responsibility for the AMRP will materially assist in bringing greater structure and attention to safety and compliance performance. A strong executive-level communications program, including top leadership is necessary to underscore the value that the Company places on such performance, its commitment to making tangible, measureable improvements in that performance, and its intention to hold people accountable for securing those improvements.

The Company has proposed the use of a senior-level safety committee. Review by a committee can support safety enhancements, but Liberty believes that it remains essential to place primary responsibility and accountability in a single executive. Primary reliance on a committee (as opposed to using a committee for oversight) will tend to diffuse the sense of personal responsibility that Liberty thinks the history here (going back to the 2008 Liberty audit) shows necessary for preventing a disconnect in the perceived commitment to safety that appears to exist between upper management and those in the three Shops who manage and supervise field work.

The Company should also undertake, and has committed to a reexamination of its approach to safety and of the design and execution of specific programs for ensuring it. This initiative will take time to plan and execute. Peoples Gas needs to give high priority to the reexamination, and commit to prompt changes to address its findings.

The Company should establish quantitative stretch goals for compliance performance, seeking measurable and material improvements year-over-year. This approach will permit a ratcheting up of safety and compliance performance as safety culture changes, as root cause analysis matures, and as measurement and incentives for reaching targets take hold.

The recently adopted use of root cause analysis should form a central part of this enhanced approach to safety. It will take more comprehensive and consistent application of inspection resources, regular use of a consistent set of performance metrics, checklists, and results reporting to support such analysis. A dedicated group should exist, at least for so long as material improvement in performance is possible. That group should perform root cause analyses, and to work with executive leadership and field organizations to identify areas where mitigation will have the greatest impact, and what forms of mitigation will work best.

The result should be focused program-improvement initiatives that dedicate resources, establish milestones, target measurable improvements, and monitor progress. Another short term effort should consist of a structured sharing of techniques, practices, and quantitative results among the three Shop areas, to identify best practices that may have common application. The Company also needs to examine means to make performance measurement more sensitive to safety and compliance performance, and to ensure that individual incentives weight this area sufficiently.

## **S.2 Peoples Gas should more closely examine the root causes and develop a responsive action plan to improve employee accident rates. (*Conclusion S.2*)**

Discussions between Liberty and senior leadership, which began last September, produced consensus on the need for specific organizational and programmatic change to address worker safety. The recommended emphasis on commitment to safety and making a senior executive responsible for championing a safety culture comprises an important first step.

Liberty recommends, and understands that the Company accepts, the need for immediate-term changes while longer term efforts progress. Peoples Gas proposed provisionally to use American Gas Association Best Practices as a method to improve safety performance. Those practices undoubtedly have merit. Following them rigorously should make near term improvements in safety. The Association, however, considers them confidential. Therefore, a broad commitment to use them will not leave the two-year monitoring effort that follows this audit with a clear baseline for measuring the effectiveness of implementation.

Therefore, the Company needs to use the guidelines as a basis for generating a clear set of standards, supporting practices, and measurable milestones and activities. This set must have enough transparency to support implementation monitoring. Moreover, other sources of best practices exist. For example, the Midwest Gas Association provides safety training. Communication with other gas associations, industry meetings, working with regulators, and reaching out to peer companies provides other sources of information.

AMRP contractors have produced worker safety results superior to those of Company workers. Examining the programs, methods, and activities the contractors use can, as Peoples Gas proposes to do, provide information useful in promoting change. The Company has also proposed to record

and regularly analyze safety performance data for longer term use in identifying problem areas and solutions. Liberty recommends the prompt initiation of focused efforts in each of these two areas.

## *Chapter T Table of Contents*

Chapter T: Governmental Coordination .....	T-1
1. Background .....	T-1
2. Findings.....	T-1
a. City of Chicago Department of Transportation .....	T-1
b. State of Illinois .....	T-3
c. Other Entities .....	T-4
d. Peoples Gas External Affairs Office.....	T-4
e. City of Chicago Communications Channels.....	T-5
f. Permits from CDOT.....	T-5
g. Permits from Illinois Department of Transportation .....	T-7
h. City Non-Compliance Citations.....	T-7
3. Conclusions.....	T-8
4. Recommendations.....	T-13

## Chapter T: Governmental Coordination

### 1. Background

This chapter discusses Liberty's examination of the relationship and coordination between the AMRP and associated activities and the various governmental and other external entities with which Peoples Gas has primary interactions, including:

- City of Chicago
- State of Illinois
- Railroads
- Chicago Parks District
- Chicago Forest Preserve
- Other utilities.

Effective AMRP performance requires strong coordination with government and other utility infrastructure planners. Such coordination must consider existing and firm city and state planned replacements and new installations. It must also consider less firm goals and objectives. The latter require consideration due to their potential for turning into shovel-ready projects. In general, even where government plans do not include certain older water and sewer facilities, gas infrastructure planning needs to recognize older, poorer performing city and state infrastructure as more likely for future replacement.

Performing an accelerated main replacement program involves a significant amount of traffic and neighborhood disruption. Close compliance with municipal rules and regulations is necessary to minimize disruptions and the costs associated with traffic management.

### 2. Findings

#### a. City of Chicago Department of Transportation

Primary interaction between Peoples Gas facilities and the City of Chicago arises from the Company's location of pipe and other gas infrastructure in the "Public Way" (roads, sidewalks, bridges, and other City transportation infrastructure). The Chicago Department of Transportation ("CDOT") maintains that infrastructure, and manages and coordinates its use by public and private utilities, contractors, developers and others seeking to locate facilities and equipment, either temporarily or permanently, in the Public Way.

The Chicago Department of Transportation maintains *Rules and Regulations for Construction in the Public Way* ("Rules and Regulations") in hard copy and online. These rules and regulations set forth the requirements for conducting private activity in the Public Way. Prior to commencement of the AMRP, the Department last updated the Rules and Regulations in 2007. Further revisions came in 2012 and again in 2014. These revisions created the City's Project Coordination Office, and made a number of substantive changes in requirements. Moreover, as AMRP activity accelerated, the City began more actively to enforce some existing regulations.



*i. Office of Underground Coordination*

In the early 1990s, after the Chicago flood, the City's Department of Transportation formed the Office of Underground Coordination ("OUC") to act as the distribution agency within the Department's Division of Infrastructure Management. The Office undertook responsibility to coordinate underground construction work, schedules, and traffic flows. The Office of Underground Coordination handles all requests related to existing utility infrastructure. The Office also manages the review and approval of construction in or adjacent to the Public Way.

The Department's Rules and Regulations state that:

*The OUC is responsible for the protection of the City's surface and subsurface infrastructure from damage due to plan and programmed construction, installation, and maintenance projects. The intent of OUC membership is to review proposed projects in or adjacent to the right of way prior to construction so that there is minimal damage to existing infrastructure.*

The Office of Underground Coordination's more than 25 stakeholders include City agencies and private entities. Members of the Office of Underground Coordination include, among others, Peoples Gas, Commonwealth Edison, Comcast, the Chicago Departments of Water and Sewer Management, a number of agencies of the City of Chicago, and various other parties. These stakeholders review all requests for work in the Public Way to determine the effects of proposed activities on existing facilities. Each member reviews individual requests, comments on those requests, and provides records of existing facilities, and notification of conflicts.

*ii. The Project Coordination Office*

Stimulated in part by the substantial increase in construction in the Public Way and the associated steep ramp-up in associated permit requests, the Chicago Department of Transportation formed the Project Coordination Office ("PCO") in 2012. The goal was to ... *improve on the coordination of projects, which were previously performed in "silos," with ... no common repository and no traceable record of attempt to coordinate activities.* The Project Coordination Office includes approximately 13 contract engineers, transportation specialists, analysts, and field staff.

The Office identified major stakeholders involved in project coordination. Those entities include:

- Chicago Department of Transportation
- City Department of Water Management
- City Department of Sewer Management
- Peoples Gas
- Commonwealth Edison
- Chicago Transit Authority
- Chicago Park District
- Comcast
- AT&T
- Dept. of Cultural Affairs and Special Events.

*iii. AMRP Interfaces with the City of Chicago*

Many Peoples Gas activities and programs require substantial engagement with the City of Chicago regarding physical activity on City property. The AMRP's high public profile and large scope impose particularly broad and important interface needs. The other Peoples Gas programs and activities requiring interface typically involve isolated repairs or individualized construction projects. By contrast, the AMRP's citywide nature, spread over the City's 50 wards over the duration of the project, involves groups of entire City blocks at a time.

Peoples Gas interactions with City personnel include a variety of meetings with City officials and representatives, the submission of various planning and design documents, the receipt of various City planning and design documents for City-owned infrastructure, applications for permits, and receipt of citations for violations of City rules and regulations.

*iv. Chicago Department of Transportation Permits*

Private activity in the Public Way (*e.g.*, opening pavement, blocking or diverting traffic, moving oversize vehicles) requires a permit from the Department of Transportation. Permits typically cover a 30-day period, and provide for two 30-day extensions at no additional charge. Beyond 90 days, the holder must apply for a new permit, and pay attendant charges. For complex projects such as the AMRP, application requires a multi-step process. The process includes certain submissions well in advance of the actual permit request. In recent years, Peoples Gas has received over 10,000 permits per year. Most Company applications cover work unrelated to the AMRP.

The City has granted some of the entities most active in the Public Way, including Peoples Gas, electronic access to the Chicago Department of Transportation computer system. This access enables electronic permit applications. Working with the City's information technology group, Peoples Gas has developed a software application (the "Portal"). This application allows the Company to perform most permitting activities electronically. Peoples Gas has access to the City's maps and engineering drawings and associated paperwork.

A written, Peoples Gas Work Management Information System Arm Web Portal procedure describes the steps necessary to prepare permit applications. Four Peoples Gas Construction Planning Office employees have access to the Portal, as do employees in other offices, including some new service coordinators and O&M staff.

**b. State of Illinois**

Some roadways in the City of Chicago fall under the authority of the Illinois State Department of Transportation ("IDOT"). Since the AMRP began, the Company has applied for and received 167 Illinois Department of Transportation permits. From the perspective of Peoples Gas and the AMRP, this jurisdiction places an overlay of more stringent traffic control requirements on street-affecting work. The City's maps designate state-jurisdictional streets. Peoples Gas has access to these designations through the electronic portal. Peoples Gas cannot, however, make electronic permit applications for state-jurisdictional streets. The Company hand delivers them, and receives comments back from the State by hand or e-mail.

### **c. Other Entities**

Peoples Gas also requires a small number of permits or similar accommodations for several other uses. They include railroad rights-of-way, park property (from the Chicago Park District), and the Forest Preserve District of Cook County.

Peoples Gas facilities cross railroad rights-of-way at numerous locations. In order to commence AMRP work on these facilities, the Company must work under an existing agreement or acquire a new permit. The latter may involve fees. Since AMRP project inception, Peoples Gas has filed for access permits for approximately 30 railroad crossings. They concern property owned or controlled by some 10 different railroads. Each railroad has its own, unique permitting process. Railroad crossing permits require long lead times and special attention. The Company maintains a spreadsheet database of current or planned railroad crossing applications.

Peoples Gas must acquire special permits for a project any part of which takes place with Chicago Park District or Forest Preserve District property. Each of these two entities has its own permit application form and specific application requirements, such as insurance coverage, submission of project plan and drawings, and applications fees. Park and Forestry permits represent a small number of permit applications annually. Peoples Gas handles them on an ad hoc basis.

### **d. Peoples Gas External Affairs Office**

Prior to 2014, Peoples Gas assigned a single employee (with support from three representatives) to handle external affairs with both the City of Chicago and the State of Illinois. This employee focused primarily on State government activities in Springfield. This combination of responsibilities left management of the relationship with the City not well coordinated. In February 2014, Peoples Gas hired a new Senior Director of Government and Community Relations. This director brought experience in Illinois government, and focused on state government affairs. In mid-2014, the Company also hired a new Manager of Local Government and Community Affairs. This manager brought extensive experience with the City of Chicago. The Company also added an additional analyst, bringing the total number of analysts to four. The Company has assigned the analysts to act as liaisons assigned to address specific City wards.

The new organization, and in particular the focus on the City, came about to enhance communication and collaboration with local government and community stakeholders. Additionally, Peoples Gas External Affairs conducted meetings with Chicago Department of Transportation officials and with Aldermen from time to time.

Recently, the Associate General Counsel, Legal Affairs, coordinated the initiation of a biweekly meeting of senior personnel involved in the relationship with the City. This meeting includes, among others, the Peoples Gas President, the general and the associate general counsel, government and community relations personnel, AMRP project management, the head of Gas Operations, and regulatory personnel. The group has met approximately half a dozen times so far, with a focus on improving overall communication with the City. The group also seeks to develop a coordinated effort to identify, at a high level in the Company, existing and potential problems with the City. Eventually, Legal Affairs hopes to continue the meetings, to maintain coordinated communication with the City and to expand the meeting focus to identify risks.

### e. City of Chicago Communications Channels

Peoples Gas uses a number of communications channels with the Chicago Department of Transportation. The channels include electronic exchange of information, meetings, applications for permits, and issuance of citations by the City. Examples of plans, drawings, and other information exchange include submission of capital design projects for review and approval, submission of a five-year Capital Improvement Plan and the City's sharing of sewer designs with Peoples Gas, when 30 percent complete, to identify potential conflicts.

The Company participates in several different types of meetings with the Chicago Department of Transportation and others parties. Most consist of regularly scheduled meetings, and most address all Peoples Gas activities, not just the AMRP. The next table summarizes regular meetings.

**Table T.1: Meetings with Chicago Department of Transportation**

Meeting	Frequency	Attendees	Topics
OUC Conflicts	Weekly	All OUC Members	City identifies overlapping footprints on jobs
Permitting	Weekly	PGL, CDOT PCO	Missing permits, follow-ups, special requirements
Weekly Task Force	Weekly	City, all utilities	Emergency Management Center - special City events
Last Friday of the Month	Monthly	PGL, CDOT	All PGL - CDOT Interactions
Dept. Of Water Mgt.	Monthly - First Thursday	CDOT, PGL Engineers	Execution phase meetings
Ad Hoc	As Needed	PGL Project Mgmt	Update on AMRP permitting & related matters

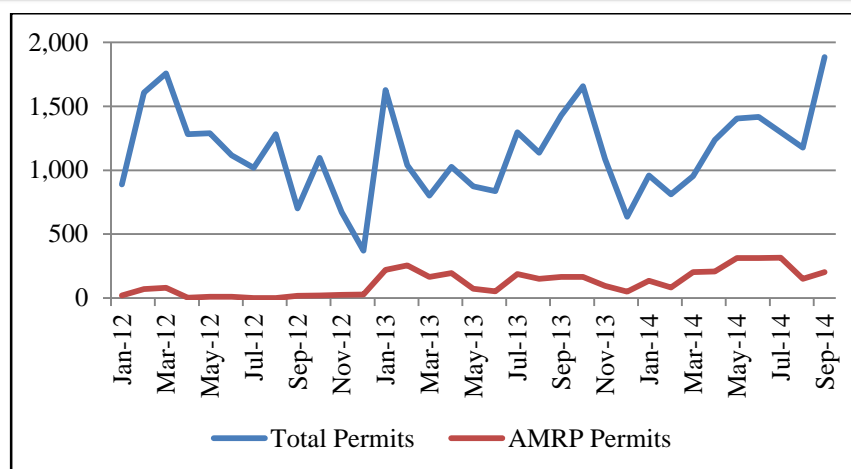
### f. Permits from CDOT

The AMRP requires a relatively small percentage of the permits Peoples Gas has acquired from the City. For example, in 2011, Peoples Gas had approximately 5,000 openings for corrosion work in the City Public Way. Comparable data is not available for that year, but for comparison purposes, the Company had acquired approximately 13,450 permits from the City in 2012. Only 1,774 (13 percent) of the permits addressed AMRP work.

One cannot compare the numbers directly. AMRP permits typically cover multiple City blocks, with multiple openings. Corrosion openings often address individual, small openings (for example, to replace an anode). In many such cases, the Office of Underground Coordination does not get involved, but from a "permit processing" perspective, each data point represents a discreet permit application.

The next graph shows the total numbers of AMRP permits received from the City for the AMRP, on a monthly basis. The data are approximations; precise data is not available. The graph shows that activities other than the AMRP drive most permit needs, when measured by permit numbers.

**Figure T.2: AMRP vs. Total Permits from the City of Chicago**



The City charges a standard fee for each permit application. The next table provides an excerpt from the Chicago Department of Transportation Permit Fee Schedule for 2015.

**Table T.3: City of Chicago Permit Fees**

Public Way Openings	Per Opening/Cut	Asphalt Restoration Fee
ADA Ramp installation	\$454 per opening	No Charge
Street / Alley	\$454 per opening	Applicant must restore
Sidewalk	\$454 per opening	No Charge
Parkway	\$226 per opening	No Charge
Soil Borings – Street	\$454 per opening	No Charge
Soil Borings - Parkway	\$226 per block	No Charge
Well Monitoring	\$454 per opening	No Charge

In addition to the base fee, various adders apply for operating equipment, parking vehicles, obstructing lanes, and various other activities in the Public Way. Some permitting fees for planned obstructions to the Public Way run higher in the Central Business District. The table below shows the total cost (in millions of dollars) to Peoples Gas for all permits and for AMRP permits during the years 2011 through September 2014. The AMRP permit cost column represents an approximation, made under the assumption that all permits fees are equal.

**Table T.4: Cost of Chicago Department of Transportation Permits**

Year	All Permits	AMRP Permits
2014 (Thru Sept)	\$13.0	\$2.2
2013	\$12.1	\$1.6
2012	\$7.7	\$0.2
2011	\$4.4	N/A
Total Program	\$37.2	\$3.9

Obtaining a permit requires two sets of filings through the Portal. During the engineering evaluation phase, Peoples Gas identifies a “project polygon” (essentially the boundaries of the project), and prepares preliminary drawings. After internal review, editing and revision, the

Company creates detailed drawings, and electronically creates a “permit pending” file in the Chicago Department of Transportation database. That filing includes drawings. The Company submits the project information to the Office of Underground Coordination and all its members for identification of potential conflicts with other facilities. The resulting identification of conflicts process (termed the Existing Facility Protection, or “ESP”) must be completed in 30 days. Pending projects typically bring discussion at an Office of Underground Coordination weekly conflicts meeting. After discussion and resolution of conflicts, the project receives Existing Facility Protection approval from the Office of Underground Coordination. Peoples Gas can then finalize the actual permit application.

#### **g. Permits from Illinois Department of Transportation**

Illinois Department of Transportation-designated Public Ways involve more stringent traffic control requirements. Peoples Gas has requested and received a relatively small number of Illinois Department of Transportation permits since the AMRP began. The next table summarizes them. This small number compares to the 55,000 Chicago Department of Transportation permits, both AMRP and non-AMRP, received for the same period.

**Table T.5: Illinois Permits**

<b>Year</b>	<b>Permits Issued</b>
2011	13
2012	92
2013	10
2014	52
<b>Total</b>	<b>167</b>

Peoples Gas does not maintain its own database for Illinois Department of Transportation permits. The Portal does not enable the identification of all Illinois Department of Transportation permitted projects in a specific report. Each individual Illinois Department of Transportation project is designated as such on the application and the permit.

Illinois Department of Transportation interests with respect to permitting concern only traffic management. Its permit applications therefore require (by contrast with City requirements) abbreviated information about pipe installation. The State, however, requires a traffic management plan. These permit applications typically require a 3 to 6 month review, but a traffic review can extend the period by a month. Prior to 2014, Peoples Gas used design consultants to prepare permit requests to Illinois Department of Transportation. However, the Company, determining that it needed better coordination of the submissions, began handling them in-house.

Illinois Department of Transportation permits are effective for 6 months. Up to a week before expiration, they may be extended for another 6 months. If the project extends beyond 12 months, Peoples Gas must reapply for a new permit.

#### **h. City Non-Compliance Citations**

Chapter S: Safety and Compliance discusses safety and permit violations in detail. That chapter focuses on their impacts on public and work safety, and on work performance effectiveness and

efficiency. This chapter addresses interfaces with the City on matters of permit compliance. Chicago Department of Transportation inspectors inspect work sites in the Public Way, to ensure compliance with Rules and Regulations. City inspectors who observe a violation may request that the crew involved remedy the problem on the spot, to the extent possible, or may issue a citation. These paper citations, similar to traffic tickets issued to the violator, specify the particular violation(s) observed. Examples include working without a permit, working with an expired permit, improper restoration of pavement or sidewalk, and improper barricades.

Beginning January 1, 2014, Peoples Gas began keeping a “citations dashboard” to improve its ability to identify the root causes of citations. For the month of September 2014, the Company received approximately 585 citations. About 30 percent of them came at AMRP locations. The Company observes that expired permits comprise the largest root cause of non-AMRP violations (representing about 21 percent), followed by unreported openings (*i.e.*, no permit) at 15 percent. Incomplete and non-compliant (relative to City specifications) restoration accounted for over half of AMRP violations.

In an attempt to reduce the numbers of violations and associated citations with respect to project completion, Peoples Gas has been negotiating with Chicago Department of Transportation to provide better definition around restoration requirements and to develop more specific guidelines on acceptable timeframes for certain longer term activities.

### 3. Conclusions

#### **T.1 In responding to the new work volumes imposed by the AMRP, the City experienced some growing pains associated with infrastructure management.**

The AMRP creates a primary programmatic interface between Peoples Gas and the City of Chicago. The nature of AMRP projects causes construction activity to run the lengths of entire city blocks, often on both sides of the street. By the end of the program, the AMRP will involve every ward of the city. These features bring to the AMRP far more attention than do the multitude of other repair or replacement projects and ongoing O&M work that neighborhoods typically experience. Significant problems at the outset of the AMRP served to aggravate the disruptions and public irritations that work on such a large scale inevitably produces.

Both the City and Peoples Gas acknowledge that when the Company began the AMRP in 2011, the City was not equipped to handle the volume and complexity of the permitting work load. Considering the poor management of the AMRP and the volume of permit requests, Department of Transportation personnel have characterized the first AMRP year (2011) as extraordinarily difficult. The City fairly promptly rewrote its Rules and Regulations, making changes in 2012, and following them with a more comprehensive, 2014 revision. The creation of the City’s Project Coordination Office came in 2014 as well.

#### **T.2 The Chicago Department of Transportation’s perception of Peoples Gas performance has been very negative, although it may be beginning to improve. (*Recommendation T.1*)**

From the Department’s perspective, the relationship with Peoples Gas is defined by much more than the AMRP. The corrosion group made some 5,000 openings in the Public Way in 2011. Thus,

while some of the observations below are AMRP-specific, many apply more generally to all operations.

Chicago Department of Transportation personnel observed that:

- Peoples Gas is very “siloed,” with poor communications across Company operations groups.
- The performance of the three Shops into which Peoples Gas divided its field operations varies considerably.
- Information conveyed by the Department of Transportation to Company managers does not make it to the field.
- Permit applications are not synchronized with construction.
- Permits stay open and active far too long.
- Peoples Gas is slow to update its databases. The Company often applies for permits to repair or service pipe it has replaced (*e.g.*, it applies for permits to replace anodes on legacy steel pipe replaced under the AMRP).
- Peoples Gas does not have enough crews to meet its schedules.
- Some areas of normal O&M operations present problems much more significant than does AMRP work.
- Restoration has continued as one of the most contentious and problematic issues. This issue results in part from the City’s approach of considering AMRP projects “open” until retirements of replaced facilities are made and final restoration is complete. The Company by contrast considers them complete at an earlier stage. Thus, if a project takes many months for final completion, a common occurrence, pavement, parkway, sidewalk, or lawn restoration either languishes or is only partially addressed. (Note that the broader issue of restoration is discussed elsewhere in this report, in this report’s Chapter Q: Field Work Performance).
- Overall, the City expects a higher level of project management and control than the Company has been able to deliver.

On a more positive note, Chicago Department of Transportation observed that:

- Communications improved substantially in 2014
- There have been some recent positive management changes
- The Department is now able to give Alderman complaints directly to Peoples Gas to address, rather than having to be the intermediary.
- The Department is willing to give the Company credit for trying to address the problems that work creates for the City.

Reorganizing External Affairs and hiring new, experienced staff in that office spawned improvement in relationships with the City and Chicago Department of Transportation. The separation of state and City liaison functions between two employees created a dedicated City liaison for the first time. The new liaison and executive management have engaged more actively with the City. This change has created the opportunity for continuing relationship improvement. The newness of this approach and structure and the history of relationships with the City make it essential for Peoples Gas to continue concerted efforts to promote a fully effective relationship with authorities responsible for AMRP permitting and compliance.



Fundamentally, however, the relationship with the City and the Chicago Department of Transportation has been and will continue to be a function of the management and execution of the AMRP and all other Peoples Gas construction and maintenance activities in the Public Way. Overall, communications with Chicago Department of Transportation and the City have improved, and show promise of further improvement. However, there is a limit to what even the most effective communications can accomplish. Beyond a certain point, which the Company appears to be approaching rapidly, improving relationships with the City will depend upon improving performance in the field. Ultimately, what is needed is good project planning, scheduling, management and execution, not just of the AMRP but of all interactions with the City and Chicago Department of Transportation.

**T.3 The Peoples Gas methods for managing permit applications and compliance have not been adequate to meet the needs of the AMRP. (*Recommendations T.2 and T.3*)**

The City's permitting function serves important public interests, and comprises a complex operation. Nobody makes more permit applications to the City than Peoples Gas does. Many parties request permits from the City for a variety of reasons. Applications range from nonrecurring, single applications by small contractors, to the thousands that Peoples Gas seeks annually. The next table summarizes the numbers of permits issued in total and to Peoples Gas alone.

**Table T.6: City Of Chicago Permits Issued**

Year	Total	To Peoples Gas		AMRP #
		(Number)	(% of Total)	
2014 (9 mos.)	107,957	12,889	11.9	1,919
2013	126,179	15,316	12.1	1,774
2012	121,041	15,006	12.4	N/A
2011	111,780	13,031	11.7	N/A

The City's permitting operation requires it to undertake a significant level of effort to address an average of over 2,000 permits per week. Moreover, the City roughly estimates that more than half of all permits involve some form of excavation. The resulting level of disruption magnifies the burden on the City to ensure that its processes protect public interests; *e.g.*, traffic flow, motorist and pedestrian safety, and the integrity of City facilities. Thus, it becomes incumbent on Peoples Gas to ensure that it does all it can to support City efforts, and to understand and be responsive to City needs.

Liberty found that Peoples Gas does not maintain a data base of permit applications. A proper tracking system, which such a database would support, should form a basic tool for managing a repetitive activity with thousands of individual elements.

Three analysts in the AMRP Construction Planning office spend full time handling AMRP permit applications. They maintain various records to track permit applications, but no database of AMRP or non-AMRP permit applications exists. Tellingly, the data on permit numbers that this chapter reports comes not from the Company, but from the Chicago Department of Transportation, which derives the information from City invoices to Peoples Gas for permit fees.

Part of the reason for the absence of a database comes from the Peoples Gas scheduling approach. The Company prepared formal project schedules only for the construction portions of work. Computerized schedules did not capture the planning and engineering phases of work. Doing so would enable the Company to capture permitting information for management and analysis. Chapter H: Schedule Planning addresses scheduling in detail.

The lack of a database presents a number of problems:

- Analysts must individually track the permits they follow, in order to ensure timely processing, and to follow-up with the City if they are delayed for any reason.
- Chicago Department of Transportation permits are “date stamped” on the date of issuance, with no record of the date of submission on the permit. Peoples Gas does not maintain a database of permit applications. Therefore, the Company cannot provide basic management control and analytic data, such as the average time from submission to granting a permit, the range of response times, or even how many permits are outstanding at a given time. The Company cites delays by the City in processing permit applications on occasion. Because Peoples Gas does not maintain a database of applications, however, it has no way to determine processing times by the City except on a case by case basis.
- Peoples Gas analysts manually track certain permits identified to them as critical, but employ no formalized reporting or tracking system.
- The permitting process does not link to project schedules.

One manifestation of this absence of a management tool is that important items get overlooked. A great many of the citations and associated fines issued by the City to Peoples Gas, discussed later in this chapter, result from lack of or expired permits.

Moreover, it is clear that the limitations described above apply to a great, and perhaps greater extent, to non-AMRP activities. The resulting problems necessarily have an impact on the overall relationship with the City and, in turn, the needs of the AMRP.

#### **T.4 Peoples Gas does not take advantage of the reporting capabilities of the Chicago Department of Transportation system. (*Recommendation T.4*)**

The City maintains an in-house database of permit applications from all entities. The City uses this database to coordinate and track permit-related activities and status. That system cannot substitute for the database that Peoples Gas needs, but it nevertheless generates a number of regular, periodic internal reports. Some of them may prove useful to AMRP management. Chicago Department of Transportation personnel expressed to Liberty a willingness to provide relevant reports to Peoples Gas through the Portal, and to consider providing custom reports. The Company has not made overtures to the City to take advantage of this potential tool for ensuring effective coordination with the City.

The Department’s computer system, to which Peoples Gas gains access through the Portal system, has limitations. The lack of application-date tracking provides an example of these limitations. The Company has accepted this limitation, rather than developing its own database to track those dates, as well as other relevant information.

For example, the City's system contains a flaw that introduces errors into addresses involving the crossing of intersections. Most AMRP applications include intersection crossings. Permits in these cases thus issue with incorrect addresses. Peoples Gas must request and receive the needed corrections. Both the Chicago Department of Transportation and the Company acknowledge this problem. Peoples Gas has not developed a good work-around. The City expects this problem to be remedied with an upgrade to its system, now anticipated in early 2015.

Peoples Gas also believes that limitations on administrative staffing at the Chicago Department of Transportation impedes permitting processes. Without investigating the accuracy of this perception, Liberty nevertheless believes that prior performance problems at Peoples Gas and historically poor communications between the Company and the Chicago Department of Transportation make discussion and resolution of that perceived roadblock difficult.

**T.5 Peoples Gas has an appropriate process for managing the permitting of rail crossings, but does not enter all relevant data into its tracking tool. (*Recommendation T.5*)**

Since AMRP inception, Peoples Gas has processed approximately 30 rail crossings with some 10 different railroads. These crossings include AMRP and non-AMRP activities. Peoples Gas determines the need and prepares applications for those permits on a case-by-case basis. Such applications typically require long lead times and processes unique for each railroad, and sometimes for each crossing. The Company tracks the status of the applications and related activities with a spreadsheet.

The small number of railroad crossings and related permits and the individualized requirements of each railroad would render a standard application procedure ineffective. For the same reasons, the simple spreadsheet database appears appropriate. However, not all elements of the database maintained by the Company are complete. In most cases the database does not indicate when the status of each application was last reviewed, and does not provide for future review or due dates. It also does not indicate the responsible person(s) in the organization.

**T.6 Peoples Gas is cited extensively for non-compliance with Chicago Department of Transportation Rules and Regulations for both AMRP and non-AMRP work. (*Recommendation T.6*)**

Peoples Gas provided a partial database of citations dating back to 2008. It demonstrates that the Company has been cited for violations many hundreds of times, perhaps over a thousand times per year by Chicago Department of Transportation inspectors. In 2013, total fines associated with citations approached a half million dollars for the year.

The results indicated by the citations dashboard in 2014 and the citation database, although incomplete, support the City's statements, summarized earlier, that restoration represents a chronic problem area. The largest numbers of violations appear to be related to restoration, followed by no permit or working outside the limitations of the permit. Chapter S: Safety and Compliance addresses the planning, scheduling, and work performance issues that contribute to such permit violations.

**T.7 The AMRP has not generated an abnormally high level of traffic management concerns.**

Discussions with the City did not identify the management of traffic to be a significant problem area. Liberty's field investigation team also did not observe notable traffic flow or management issues during visits to construction sites. Note that Liberty did not audit for compliance with specific Chicago Department of Transportation traffic regulations, compliance with the Americans with Disabilities Act ("ADA"), or other City ordinances. The team limited its field observations about traffic to general conditions associated with minimizing traffic obstructions and promoting public and worker safety.

## **4. Recommendations**

**T.1 Peoples Gas needs to continue to focus on improving communications and relationships with the City and with its Department of Transportation, but must recognize that it will take improved permitting and work performance to create and sustain relationships at the level needed to optimize AMRP performance. (Conclusion T.2)**

Peoples Gas has made substantial strides in addressing the issues it has with the City, through designation of a specific liaison and resultant activities. The internal meetings focusing on City-related activities also show high level attention to the relationship. Permanent and meaningful change will require a continuing priority on relationship improvement. However, as important as communications and relationships with the City may be, Peoples Gas performance in the field becomes the more important factor going forward. Improving performance in meeting permitting requirements and expectations comprises a more significant driver of the relationship with the City and of success in carrying out the AMRP, as other chapters of this report address.

**T.2 Peoples Gas should expand the scope of AMRP project schedules to incorporate permitting requirements. (Conclusion T.3)**

Chapter H: Schedule Planning addresses the lack of integration in AMRP project schedules, which have included only construction activities. Project scheduling needs to integrate permitting needs and requirements. A complex long-term project with many thousands of individual activities requires a sophisticated, integrated management control system that tracks individual component projects end to end. From a management control perspective, there is no bright line between phases such as planning, engineering and construction. Precursor activities in one phase often prove critical to the following phase. Permitting should not be considered a parallel activity, but an integral part of the end-to-end set of processes needed to effectively and efficiently manage AMRP projects. Permitting should form a central part of the scheduling process.

**T.3 Peoples Gas should develop a database of permit applications. (Conclusion T.3)**

Peoples Gas cannot expect to rely on the Chicago Department of Transportation database as its management tool. The City designed it to meet the needs of the Chicago Department of Transportation's permitting operation, not the business of constructing and maintaining a gas system. The Chicago Department of Transportation database is not under Peoples Gas control, does not include a number of parameters that Peoples Gas should be tracking, and cannot be validated by the Company. A spreadsheet database can be developed and implemented very

quickly, on a going-forward basis, to improve the Company's knowledge and control over its permitting operations.

The permit database should include all permit applications to the Chicago Department of Transportation. From the Department's perspective, the distinction between AMRP and non-AMRP work is not material.

**T.4 Peoples Gas should work with the Chicago Department of Transportation to determine which existing and potential reports from the Department's system are available and which could be provided to Peoples Gas. (*Conclusion T.4*)**

Department representatives indicated to Liberty the existence of regular internal reports of permitting activity that it could provide to the Company. It may be able to create some custom reports as well. The Company would be well served to meet with the Department to explore that option, for the purposes of better managing its construction and operations and understanding the City's perspective on Company activities. Reports from the City are not a substitute for a Company database, but will help until one is developed, and will enable Peoples Gas to see what the City sees on a continuing basis.

**T.5 Peoples Gas should improve the database of rail crossing permits. (*Conclusion T.5*)**

The relatively simple spreadsheet database of railroad permits serves AMRP needs generally. However, it is incomplete and not up-to-date. It operates as a "side record," as opposed to a formal project management tool. The "one-off" nature of rail crossing permits and their long lead times create sources of potential gaps (*e.g.*, in identifying critical activities and milestone dates). The Company should clean up the database, and keep it current.

**T.6 Peoples Gas should improve its database of citations. (*Conclusion T.6*)**

Fundamentally, Peoples Gas needs to improve its management and construction practices to reduce dramatically the number of citations. However, in the meantime and even with a much reduced number of citations, a database is a fundamental management tool to provide feedback to management and to the Shops and crews as to how the Company is performing in complying with applicable rules and regulations. As with the permit database, the citations database operates as a side record rather than a tool embedded in AMRP management processes.

## *Chapter U Table of Contents*

Chapter U: Customer Coordination .....	U-1
1. Background .....	U-1
2. Findings.....	U-1
a. Access to Customer Premises .....	U-2
b. Customer Complaints.....	U-3
3. Conclusions.....	U-4
4. Recommendations.....	U-7

## Chapter U: Customer Coordination

This chapter addresses the methods used to gain access to customer premises to change meters and to cut services over to new supply facilities. It also examines the sources of customer complaints about impacts of the AMRP and Peoples Gas methods for responding to those complaints.

### 1. Background

New main and service installation can cause significant disruption to neighborhoods. The work affects residents, municipalities, and those using the streets. Peoples Gas construction crews must interrupt street and driveway parking, and dig up lawns and sidewalks. In many cases, Peoples Gas crews can only restore property temporarily, until weather cooperates sufficiently to permit concrete pours, sod laying, and replanting. Even when a main replacement project goes smoothly and on schedule in a community, it still brings substantial public inconvenience. Programs to accelerate main replacement magnify this impact, thus heightening the risk to program success and Company image.

Effective and timely communications about planned work and progress in performing it form a critical component of any large project in populated areas. A program like the AMRP magnifies the challenges, because it: (a) has a broad impact on customers and communities, and (b) depends on customer cooperation for prompt and effective work completion. The AMRP involves large scale relocation of inside meters, regulators, and shut-off valves to the outside. It also requires installation of new service piping to connect to new mains. The multi-step process for accomplishing work requires considerable coordination with customers in gaining access to meters for moving, cutting over, and relighting gas service.

The quality of customer experience during the project offers a principal measure of AMRP success, and ultimately the Company's image in the community and with public officials. Minimizing the negative impacts that this experience brings requires well-planned and comprehensive efforts. Such efforts must explain the work process, highlight the benefits that work completion will bring, and keep customers and other stakeholders informed about progress. An effective process for responding to questions, issues, and complaints must exist. In order to maintain good customer rapport, Peoples Gas also needs to demonstrate flexibility in responding to varying customer needs. Flexibility may require scheduling crews to work evenings and weekends, or by-appointment, particularly for customers unavailable during normal business hours.

Managing customer communications effectively requires development of a communications plan that identifies the range of customer expectations and needs and communications materials to address each.

Liberty examined how Peoples Gas has identified the range of customer needs and expectations and the sufficiency of efforts to meet them.

### 2. Findings

As expressed in Peoples Gas AMRP Communications Plan:

*The AMRP program is the largest infrastructure improvement project ever undertaken by Peoples Gas, and it will touch a significant portion of the Chicago community whether directly through construction to replace lines that serve homes and businesses,*

*or through resulting ancillary traffic disruptions, or through cost of service. Given the magnitude and visibility of the program, Peoples Gas recognizes the criticality of effectively communicating the impacts and benefits to stakeholders across its service area.*

The AMRP Communications Team created a Communications Plan and templates to assist with communication of the program prior to kickoff in 2011. The AMRP project charter designated a Communications Team responsible for internal and external AMRP-related communications. Specific deliverables defined in the charter included a project Communications Plan, communications materials and a “revised and updated” process for communicating about AMRP to all stakeholders.

*The goal of the overall communications effort for the AMRP program is to maintain Peoples Gas’ image with the community, and to look for opportunities to enhance the company’s image where possible.*

Peoples Gas published a draft AMRP Communications Plan in May 2011, prior to the launch of the program. The draft Plan identified and discussed:

- Communications Objectives and Goals
- Key messaging
- Communications materials to be developed and material review protocols
- Media Relations and Governmental Affairs protocols
- Public Relations and Media events and potential sponsorship opportunities
- Communications protocols
- Goals, strategy, concerns, messaging for each key stakeholder
- Internal and external communications strategies and tactics
- The need to develop a program to handle escalated complaints
- Existing communications channels that can be leveraged
- The need to define measures to determine success in achieving goals and objectives of the Plan
- Plan for AMRP kick-off/ribbon cutting to introduce program to employees and recognize work-to-date.

However, Peoples Gas did not keep the plan up-to-date. Moreover, the three Peoples Gas district field organizations (the “Shops”) did not adopt the plan fully. The Communications Team created the Plan, and facilitated communications processes in the field. Management, however, allowed the Shops to deviate from the plan, and continue with a business-as-usual approach for AMRP meter-access communications.

#### **a. Access to Customer Premises**

Peoples Gas requires access to customer homes and buildings at least twice during the main upgrade process: (a) first for service markings, and (b) second to move the meter and connect to the new gas main. In some cases, the Company requires a third appointment to locate and check the sewer line.



A month before contractor construction crews begin work in a neighborhood, the Company mails introductory letters and an informational flyer to customers. These materials explain the program and set expectations. This process begins when a block permit is ordered for a neighborhood. First, Peoples Gas' customer information system, identifies all affected accounts within a neighborhood, and mails the introductory letters.

A week later, Peoples Gas sends a follow-up letter requesting an appointment to mark-out the service. The letters instruct customers to call the Contact Center or visit the website to set an appointment. Peoples Gas intends to move indoor meters to the outside of customer premises. Service marking thus also identifies the most logical outside location for the meter. Construction contractors generally follow within a month to lay the new main and services.

Peoples Gas Shops have responsibility for moving the meter and for hooking it up to the newly built service. The shops set appointments for this process differently. The North and Central Shops prefer to set appointments directly. For instance, a crew moving into a neighborhood, contacts customers by going door-to-door. District supervisors will also make calls to customers after-hours and on weekends. Posters, flyers, and other leave-behind materials refer customers to Shop phone numbers or personal cell phone numbers to schedule appointments.

The South Shop prefers that Peoples Gas Contact Center schedule customer appointments, using standard letters sent to customers listing the Contact Center's toll-free number.

#### **b. Customer Complaints**

Peoples Gas received more than 4,000 complaints related to the program from 2012 through last fall. The Company reports that the number now surpasses 5,000. Property damage and restoration top the list of AMRP customer complaints, as seen in the table below.

**Table U.1: AMRP Complaints Received**

<b>Complaints Received</b>	<b>2012</b>	<b>2013</b>	<b>2014</b>	<b>Total</b>
AMRP Field Employee Complaint	36	12		48
AMRP Restoration Complaint	277	85		362
Construction Complaints and Inquiries				0
Field Employee Complaint		37	133	170
Inquiries		101	115	216
No Parking Sign/Car Tow		16	24	40
Property Damage		575	918	1493
Restoration		773	866	1639
Safety Concerns		173	311	484
Construction Inquiry Voice Mail		140	257	394
<b>Total</b>	<b>313</b>	<b>1,912</b>	<b>2,624</b>	<b>4,849</b>

As of October 31, 2014, more than 600 complaints remained "in progress" while another 400 awaited assignment for processing. The Company reports that those awaiting assignment have

since dropped to 200. Last October, the total number of active complaints was 1,036. The Company reports that this number has dropped to 870.

For a variety of reasons, construction-related customer complaints have soared. Peoples Gas created a group to respond initially to customer complaints. Company policy calls for contact with customers within 24 to 48 hours of complaint receipt. Insufficient staffing and a growing volume of complaints, however, have prevented this group from acknowledging or “opening” complaints from customers for six to eight weeks.

Peoples Gas does not conduct root cause analysis to identify and resolve process-related complaints. Lack of root cause analysis and follow-up results in many repeat issues and continuing customer complaints. In addition, the AMRP Project Management Office does not use complaint trending to rank or penalize contractors. Peoples Gas prepares no contractor performance scorecards.

Peoples Gas does not ask for customer feedback or measure customer satisfaction in response to work performed. As a result, much of the AMRP customer communications operate reactively, in response to complaints from stakeholders or issues encountered in the field.

### 3. Conclusions

#### **U.1 Peoples Gas failed to update its draft AMRP Customer Communications Plan until recently and the Company has not monitored use of its Plan protocols and procedures in the field. (*Recommendation U.1*)**

Peoples Gas updated its 2011 draft AMRP Customer Communications Plan in December 2014. However, the revised AMRP Communications Plan fails to address several items, including:

- Protocols and strategies for dealing with uncooperative customers
- Process to update customer needs and expectations as the project progresses
- Process to gather customer feedback and measure customer satisfaction.

The Company did not finalize the plan prior to program launch. It has also not updated it to reflect changes to the communications process or materials in the intervening three years. Considering the risks to Company image and customer satisfaction, Peoples Gas should review and update this program-specific communications plan annually to address customer notification and public communication in regards to meter access and cut over, including templates and prepared communications addressing these needs. The Company has stated that an update is now underway.

#### **U.2 AMRP communications techniques have been inconsistent. (*Recommendation U.2*)**

Peoples Gas requests appointments for service mark-outs through a standard letter process, and the Contact Center schedules them. However, each Shop individually handles requests to schedule appointments to move meters. This approach may prove easier for the Shops to manage. It can, however, cause confusion for customers, who set the first appointment through the Contact Center. A month or so later Shop personnel go door-to-door to set appointments with customers. In some cases, no letter or other communication informs customers about the process from end-to-end.

This approach causes problems in addition to inconsistency in the customer experience. Customers may not be home, or unwilling to answer the door. Door-to-door delivery of brochures involves

significant costs. The Peoples Gas field employees going door-to-door also do not have the customer-service “soft skills” training necessary for making such contacts effective.

The Shops record appointments on handwritten lists. The Shops do not document appointments appropriately in the Peoples Gas customer information system (known as “Cfirst”). The Contact Center therefore has no record of these appointments. Customer Service Representatives thus do not have the information that enables them effectively to answer questions or reschedule appointments.

### **U.3 Peoples Gas’ communications processes for setting service marking appointments have become more appropriately coordinated as AMRP work has progressed.**

Peoples Gas initially planned to make communications with customers 90 days prior to contractor construction. However, the Company soon fell behind schedule marking services, in major part due to lack of well-coordinated customer communications. Difficulties in scheduling customer appointments left many services unmarked as contractor crews moved into an area. This circumstance caused service installation delays. Peoples Gas realized that it needed another approach to communicate with customers to arrange service markings.

During the second year of AMRP work, the Company decided to mark services in the fall and winter, well prior to spring construction. This blanket approach proved successful in marking services. However, markings got too far ahead of construction, and in some cases the markings were lost or destroyed requiring re-marking and causing delays.

The following year brought a more coordinated approach to service marking. This approach employed a series of four letters, sequenced to begin a month prior to construction. The first letter introduced the program, asked for cooperation in accessing the meter, and attempted to set expectations for project timing and ultimately, restoration. Subsequent letters asked customers to set appointments, and, for unresponsive customers, warned of pending service disconnection.

The use of this approach continues, and appears to work better for customers and contractors.

### **U.4 The Customer Service organization adequately supports the AMRP meter access appointment setting process, but the customer information system does not facilitate the process from end-to-end. (*Recommendation U.3*)**

An external vendor, iQOR, has provided call center services for Peoples Gas since 2011. The Integrys Business Support Customer Service organization provides for training, handling escalated issues, and monitoring Call Center quality and performance. Customer service representatives receive AMRP-specific training to support inquiries, enable appointment setting, and handle complaints. Customers can schedule appointments for service markings or meter moves by calling a toll-free number that reaches the Contact Center. Representatives undergo training to ask for any special access instructions, inform customers of the process, and update the customer record as needed with owner information. After-hours, the Company’s telephone system (“IVR”) can assist callers in setting appointments and can take messages regarding the program. The website assists with AMRP communications, providing program brochures, frequently asked questions, and scheduling appointments.

Peoples Gas uses its customer information system (linked to a geographic information system) to identify accounts within a neighborhood scheduled for AMRP work. The system selects customers for a series of letters explaining the program and asking for assistance in moving the meter. The customer information system also records the sending of these letters to customers. However, Peoples Gas has not integrated the customer information system with its field work management system. Field management thus implemented a standalone database to track letters to customers, manage appointment availability, confirm appointments, and track “in service” status after service activation by a Peoples Gas crew. However, the Customer Service organization and the Contact Center do not have access to this field database. The corporate information systems organization does not manage or support the work management database.

Integritys plans to replace Cfirst (the customer information system) within the next two years, as part of an initiative (called “the Integritys Customer Experience,” or “ICE”), to provide a common billing system for all operating companies.

**U.5 Peoples Gas has not consistently scheduled off-hour appointments for customers unavailable during normal business hours. (*Recommendation U.2*)**

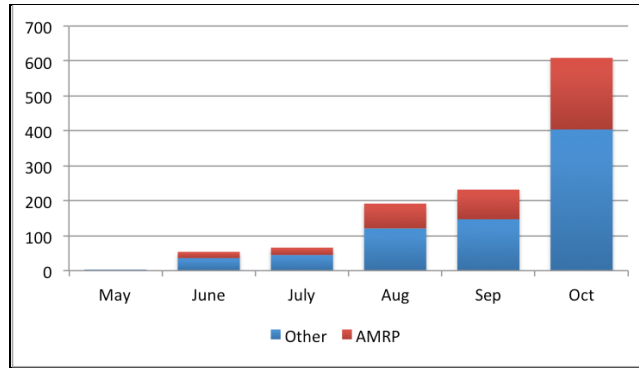
The Company recently limited the availability of after-hours appointments to move meters. The letter requesting a customer appointment offers hours from Monday through Friday, between 8 am to 7:30 pm. It also offered Saturday appointments from 8 am to 3:30 pm. However, from August through October 2014, Peoples Gas Shops were not permitting the scheduling of Saturday appointments. This restriction frustrated many customers, and increased complaints and special handling requests.

**U.6 Peoples Gas’ AMRP complaint handling group is overwhelmed by the volume of complaints. (*Recommendation U.4*)**

Peoples Gas established the Construction Complaints group (reporting to the Division Street Radio Room in Gas Operations) in 2012 to coordinate complaint resolution. Currently, this group has insufficient staff to handle the volume of complaints received. Peoples Gas policy stipulates that customers will be contacted within 24 to 48 hours of their complaints, in order to gather as much information as possible about the situation. However, the Construction Complaints Team has not met this goal.

As of October 31, 2014, 400 AMRP-related complaints remained pending. Peoples Gas received some of them in June 2014. The Company reports that those numbers have fallen by about half since then. The Construction Complaints group handles all construction complaints, including those related to the AMRP. A large number experience significant delay in getting assigned for handling. Some customers who voiced complaints in June 2014 have not yet heard from a Peoples Gas complaint-handling representative.

**Figure U.2: Unopened Construction Complaints (Awaiting Assignments)**



A complaint may take weeks or months to resolve, depending upon its nature. As of last fall, it had taken an average of 103 days to complete complaint processes. The Company reports that this duration has since fallen to 81 days.

Clearly the pace of assignment and resolution is unacceptable.

**U.7 Peoples Gas does not measure the AMRP customer experience. (*Recommendation U.5*)**

Peoples Gas routinely measures transactional customer service, both in the Contact Center and in the field. The Company also participates in the JD Power and Associates Residential Customer Satisfaction program. The Company does not, however, specifically track customer satisfaction with AMRP-related work.

Peoples Gas attempted to measure satisfaction with AMRP very early in the program. It discontinued measurement, citing difficulties due to the length of the AMRP customer experience. Months can pass between construction and restoration. Peoples Gas is not measuring customer satisfaction with the AMRP program.

## **4. Recommendations**

**U.1 Peoples Gas should alter the AMRP Communications Plan. (*Conclusion U.1*)**

Peoples Gas revised its Communications Plan for AMRP in December 2014. This effort had been underway since July 2014. While the updated Communications Plan reflects project revisions to date, it fails to address the findings of this chapter. Specifically, the most recent Communications Plan requires amendment to discuss:

- Protocols and strategies for dealing with uncooperative customers
- Process to update customer needs and expectations as the project progresses
- Process to gather customer feedback and measure customer satisfaction

Following Plan modification to address these concerns, Peoples Gas should communicate the Plan throughout the organization and train contractors and employees on its use.

**U.2 Peoples Gas should standardize the process to set AMRP customer appointments. (Conclusions U.2 and U.5)**

Peoples Gas should standardize the appointment setting process and the Contact Center should set all appointments to facilitate a one-stop experience for customers. The Company should use the customer system to set and track appointments. These changes will provide a more consistent experience for customers. Peoples Gas should also consistently offer options for after-hours and weekend appointments to accommodate customers who need them.

**U.3 Peoples Gas should ensure that the Customer Information System fully supports AMRP communications processes. (Conclusion U.4)**

Integrays plans to replace Cfirst within the next two years. Whether or not that replacement takes place, Peoples Gas should make sure that its customer information system supports the AMRP communications process. In addition, Peoples Gas should integrate its customer information system with its field work management system. Sound integration will allow Peoples Gas to track field progress and communicate that progress across the organization and to customers. This integration will eliminate the need to maintain a standalone database in the field and improve Customer Service responsiveness.

**U.4 Peoples Gas should adequately resource the AMRP Complaints Handling Group, and should monitor complaint resolution performance and the root causes of customer complaints, for the purpose of identifying improvement opportunities. (Conclusion U.6)**

The Construction Complaints group has insufficient staffing, considering the current volume of pending and active complaints. The group needs additional manpower to open and assign complaints. The Company should contact customers within 24 to 48 hours to acknowledge receipt of the complaint. Additionally, management should monitor complaint resolution to ensure proper investigation of issues and effective resolution by the responsible organizations. Peoples Gas should address this problem as soon as possible.

Peoples Gas should investigate the root cause of AMRP-related customer complaints, and complaints from other stakeholders. These root cause analyses should drive improvement in policy, procedure, protocol, and communication.

**U.5 Peoples Gas should measure on a regular basis: (a) customer satisfaction with AMRP, and (b) the effectiveness of AMRP Communications and Customer Service. (Conclusion U.7)**

Peoples Gas should begin measuring customer satisfaction with the AMRP process. An AMRP project can extend over weeks and months. Peoples Gas should measure satisfaction for individual components of the process, such as customer letters, program information, website, appointment setting, service marking, service installation, meter installation, and restoration.

Peoples Gas should measure and track satisfaction with program components to identify opportunities to improve the customer experience and internal policies and procedures.

In order to measure the effectiveness of AMRP Communications and Customer Service, Peoples Gas needs to identify and routinely chart performance against specific metrics. These metrics should include, but not be limited to, customer satisfaction, complaints per customer, missed or late appointments (by Peoples Gas), average time to respond to inquiries and complaints, and time to resolve complaints. Performance should be trended and reported along with other Project Management Office metrics on a weekly or monthly basis throughout the life of the program.

# Part Five: Monitoring



## *Chapter V Table of Contents*

Chapter V: Monitoring.....	V-1
1. Background .....	V-1
2. Program Performance Monitoring Objectives and Guidelines .....	V-2
3. Recommended Program Performance Monitoring Process Flow .....	V-4
4. Report Content .....	V-5
a. Program Cost .....	V-5
b. Program Schedule .....	V-7
c. Safety and Quality.....	V-8
5. Recommendations.....	V-9
Chapter V Appendix: Program Performance Monitoring Guidelines .....	V-11

## Chapter V: Monitoring

### 1. Background

Liberty's work scope includes development of a method to allow the Illinois Commerce Commission to monitor AMRP program costs and progress. Peoples Gas issues a monthly AMRP Status Report of about 50 pages. The Company does not provide this report to the Illinois Commerce Commission. The Company also produces weekly production curves. Peoples Gas also submits monthly and annual filings reporting on the Qualifying Infrastructure Plant Surcharge. The first annual filing came in April 2014. These reports do not provide (nor does their intent include) material suitable to meet Illinois Commerce Commission cost and schedule monitoring.

Two forms of regulatory monitoring involving the AMRP bear discussion, given the nature of Liberty's conclusions and recommendations about reporting performed for purposes of AMRP management, control, and oversight.

- **Implementation Monitoring:** The Commission anticipates a two-year program of monitoring of actions by the Company to implement the recommendations of this report.
- **Program Performance Monitoring:** The size, importance, and length of the AMRP makes the transparency of central program measures important to the Commission and to public stakeholders. The current status, forecasts, and threats facing program costs, schedule, and degree of safety risk mitigation form the most important of these elements.

Implementation Monitoring will rely on outside consultant services. Program Performance Monitoring does not fall within the scope of those outside services. The need for performing this second form of monitoring merits attention to the question of the availability of Commission Staff resources. This report addresses the significant cost, schedule, and risk mitigation uncertainties that face the AMRP. This report also addresses the broad and deep set of changes that Peoples Gas needs to make to provide sufficient management, control, and oversight of the program. Some of the key changes will likely take most or all of the two-year recommendation monitoring period. Following full implementation, the program will still face substantial risk. While the recommendations of this report to be fully implemented, those risks will remain even higher, thus underscoring the importance of Program Performance Monitoring and the need for identifying methods to give Commission Staff the ability to perform it.

This report chapter focuses on the development of a process for Program Performance Monitoring. The reasonably straightforward process for designing Implementation Monitoring will occur (and monitoring will begin under it) following acceptance of this report. Designing the second form faces unusual difficulty. A significant number of this report's conclusions and recommendations about AMRP management, control, and oversight address program and project performance data collection and reporting. Moreover, changes in underlying program elements (*e.g.*, cost estimating and scheduling) must also occur to enable reporting scope and quality to reach the desired levels.

Were it not for the need for such improvements, the process of designing Program Performance Monitoring for execution by the Illinois Commerce Commission would also prove more straightforward. Current AMRP reporting by Peoples Gas, however, makes its reporting (and therefore monitoring by the Commission) problematic. Only after such reporting improves

substantially will answers to cost, schedule, and risk mitigation questions provide meaningful insights into AMRP status, progress, and what the prospects are for the longer term.

Reporting that serves regulatory monitoring needs should build from the same information and systems that support AMRP program and project reporting. Such commonality is critical to making Program Performance Monitoring meaningful and accurate. The nature, structure, and quality of AMRP program and project reporting will remain “under development” for much and in some respects probably all of the two-year Implementation Monitoring period. These aspects of reporting will change as Peoples Gas completes implementation of this report’s relevant recommendations, which means that the specifics of longer term Program Performance Monitoring will likely change as well.

The combination of the AMRP’s long length, vital contribution to public safety, massive costs, and integration with parallel programs (increasing delivery system pressure and relocating meters to outside locations) appear likely to continue to make outside reporting and monitoring of cost, schedule, and success in reducing safety risk important well after the end of the Implementation Monitoring period. What form that longer term reporting will need to take should consider a number of factors that may change in the next two years. They include stakeholder input, any factors that a change in control of Peoples Gas may occasion, and future levels of Commission Staff available for performing longer-term monitoring, for example. The Staff resources question has particular importance in developing a long-term monitoring program that meets Commission needs, but matches the resources available to execute it.

## **2. Program Performance Monitoring Objectives and Guidelines**

Liberty considered the following objectives in the design of Program Performance Monitoring:

- Monitor deviations from the cost and schedule performance required for success of the AMRP
- Understand the factors causing such deviations
- Assess the degree of safety risk mitigation actually achieved as a function of the resources expended to produce that level of mitigation
- Measure the changes in operating costs (and benefits) achieved through execution of the AMRP and the other programs managed in conjunction with it
- Obtain information from Peoples Gas management on the actions being taken to correct deviations from expectations
- Establish mechanisms for monitoring management’s effectiveness in the overall execution of the program.

Designing a performance monitoring program for the Illinois Commerce Commission must take into account that at this time Peoples Gas’ AMRP reporting and management will not support the Commission’s ability to accomplish even moderately detailed monitoring. However, if Peoples Gas aggressively and successfully executes the initiatives it has stated to Liberty, these circumstances will improve. The important needs that Peoples Gas must fill, for purposes relevant to Program Performance Monitoring include:

- A credible AMRP plan from which to measure

- A program management organization having the capability for insightful analysis of project performance
- Management processes for formally responding to project issues as or before they become “problems.”

Judging or designing a report requires particular attention to its purpose. The effectiveness of management and of AMRP oversight raise the matter of primary interest here. This focus suggests two types of reports: those whose purpose seeks to facilitate management or oversight of the program, and those that exist simply to keep people informed.

A report’s design intent should align with its users’ expectations and intended use. The first challenge thus becomes what the Illinois Commerce Commission should logically expect from Peoples Gas reporting and, more importantly, what it seeks to do with the information. The temptation to start with a list of performance indicators may produce a wrong focus. Indicators often have questionable value, for a variety of reasons. Take as an example the bulk performance of AMRP in 2014. At mid-year, bulk performance on main and service installations fell well behind schedule. A literal interpretation of the curves would suggest no way to make up the gap. Peoples Gas reported that production would catch up, and reach planned levels by the end of the year. However, if this observation had validity, it would also call into question the value the performance indicator had in the first place. Such an indicator can only become accurate after the 365<sup>th</sup> day of the year. Liberty cautions against over-reliance on performance *indicators*, emphasizing instead the role of performance *insights*. Insights go beyond the data to supporting analysis of precisely what is happening and why.

One should not anticipate a fixed set of reporting requirements that remains for 20 years. The AMRP will remain fluid and dynamic. The issues it raises will change. The information priorities of the Illinois Commerce Commission and its stakeholders (in terms of needed insights into the program) may change as well. Monitoring mechanisms should remain flexible. The change process needs to be continuous. Readers of the reports should revisit reporting requirements after the issuance of each report. The quarterly reporting recommended below supports this level of frequency in ensuring that reporting stays abreast of changing issues, priorities, and work progress.

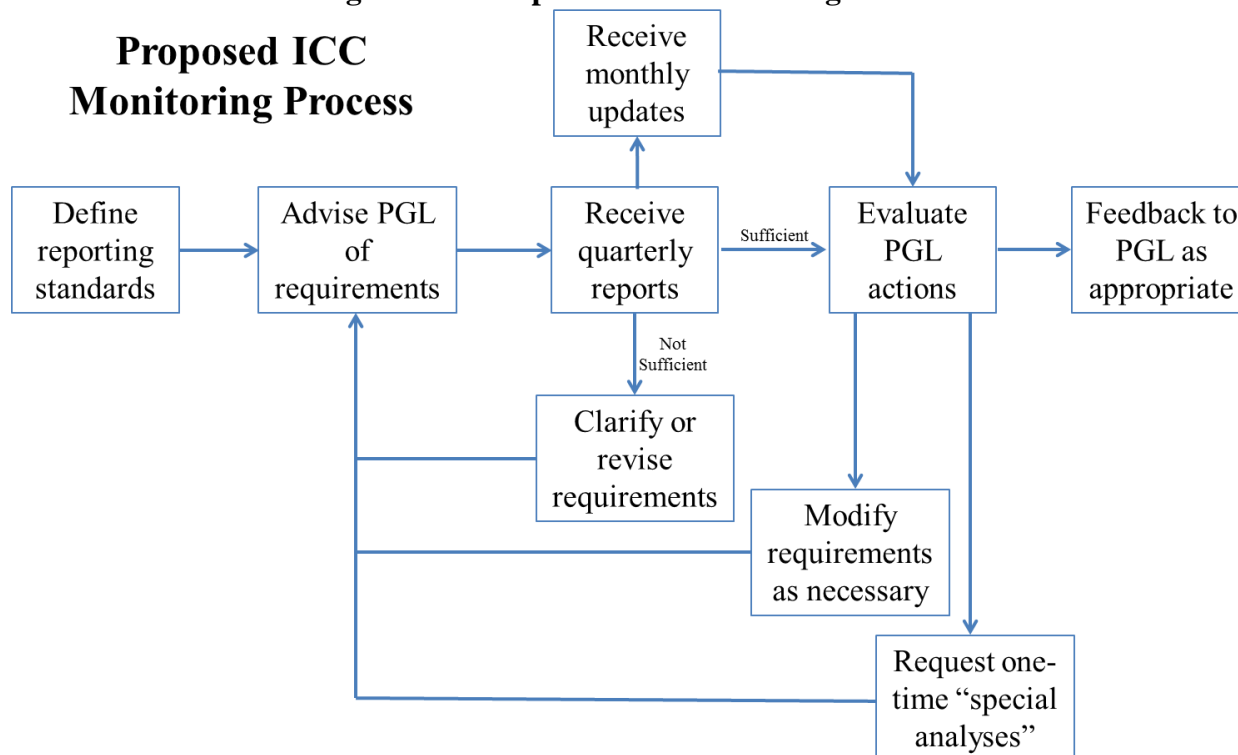
Liberty also finds value in reasonably frequent “special analyses.” These “white papers” may contain only a few pages. Their importance lies in providing more in-depth analysis of issues that arise from reviewing standard reports. Peoples Gas may volunteer such an analysis, to address a particular area of emerging interest. The Commission may request one in response to a specific concern, or simply to gain more background in understanding a critical area. Chosen and prepared carefully, these special analyses can become a particularly valuable report feature.

Project reports are usually lengthy. They can aggregate a mass of data, charts and graphs, text, colors, and dashboards. Too much detail dilutes the value of important material, which can become difficult even to locate. Accordingly, content should reach a level and focus designed to allow outside monitoring to accomplish its objectives. The length of the report should also respect the fact that the objectives of regulators and stakeholders should stop short of the day-to-day workings of the program.

One needs to contain reporting to what will keep reporting effective. Monthly reports would prove too frequent, except perhaps during the period in which efforts remain underway to redefine them as part of the implementation of this report's recommendations. A quarterly report certainly becomes more optimum after what will hopefully prove a reasonably short transition period for making the program management, control, and oversight changes warranted. Analyses performed and corrective actions identified by Peoples Gas would come quarterly.

### 3. Recommended Program Performance Monitoring Process Flow

Figure V.1: Proposed ICC Monitoring Process



The process charted above requires an initial definition of outside reporting standards for Peoples Gas. The Company will begin delivery of regular reports in response. Meeting full requirements immediately is not likely, thus suggesting a brief trial-and-error period. The “not sufficient” path shown in the figure illustrates how such a conclusion by the Illinois Commerce Commission report reviewers will lead to clarified or revised instructions for Peoples Gas, with the cycle continuing as needed to complete an initial shakedown.

The Illinois Commerce Commission can test Company responsiveness to program trends and issues if Peoples Gas produces credible and responsive analyses (quarterly, supplemented by special analyses as required). Such information provides a baseline for evaluating Company identification of issues and its effectiveness in constructing plans to deal with them. The process recommended also permits feedback, as appropriate, to Peoples Gas. The Commission may at this point seek added information to fill gaps in the quality of the Company’s analysis. Where Peoples Gas commits to corrective actions, monthly updates to monitor such actions should occur. During review of the regular report, Commission readers should also consider what, if any, changes should apply for subsequent quarterly reports. For example, for a substantial problem raised in the first

quarter's report, the requirements for that topic may expand for future reports. Also at this time, the Commission might identify the need for one or more "special analyses."

## 4. Report Content

### a. Program Cost

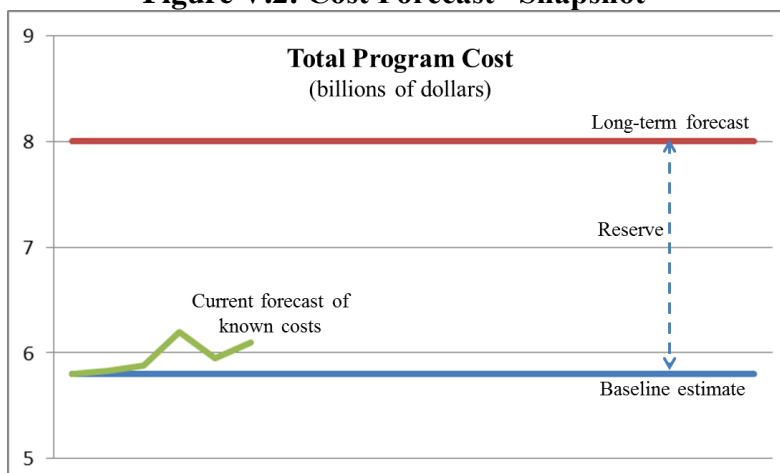
Cost reporting should begin with the use of five categories, pending development of the capability at Peoples Gas to provide meaningful data, and subject to continuing visitation:

- Long-term programmatic costs
- Annual expenditures
- Unit production rates
- Earned value indicators
- Contractor costs and change orders.

The single most important parameter over the long term is overall program cost. "Super-projects" tend to have the common attribute of continuing and substantial cost overruns. Given that cost growth seems inevitable on such projects, how one prepares a reasonable estimate and, more importantly, how one controls cost growth become material questions. Liberty's recommended approach consists of:

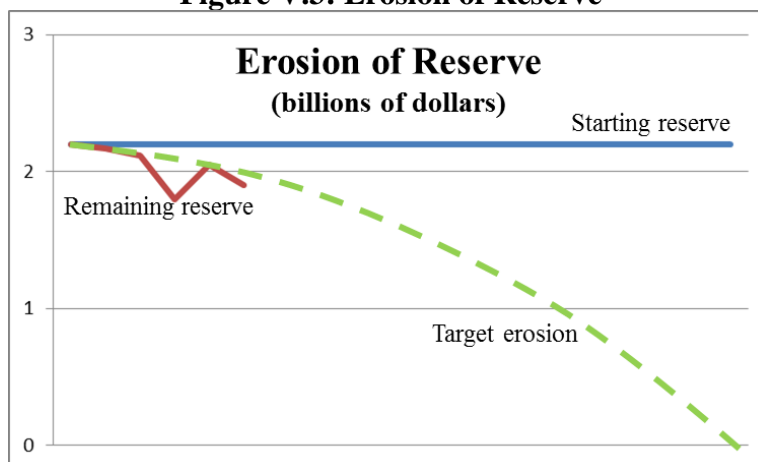
- An estimate prepared using traditional methods. This base estimate, termed "known costs," should result from a working model (not yet in existence for the AMRP), in order to permit tracking and reforecasting on a continuing and meaningful basis.
- A judgment process then drives a projection of potential growth in the estimate over program life. A variety of methods (including probabilistic estimating, growth from similar projects, the experience of those estimating the growth, or any other means deemed feasible for a "ball park" estimate) can drive this projection. Its goal is not precision, which must prove impossible under any circumstances. Rather, the intent is to gauge approximate upside potential. Application of this growth potential establishes a more reasonable baseline, and communicates a more meaningful perception to the Commission and other stakeholders.
- The difference between the two estimates can be characterized as a "reserve" or a "contingency."
- The "known costs" form the control base for the day-to-day management of the project. Near-term budgets and plans must all align with this estimate. This estimate forms the baseline for managing costs and it serves as the measurement basis for reporting deviations.
- On a real-time basis, as new information becomes available, the model drives re-forecasts of the various cost elements. Independently, the issuance of a cost-trend alert communicates that the baseline estimate of known costs may be in motion. Such alerts should issue as soon as possible, even in the absence of compelling data, in order to permit prompt execution of any warranted management response. In any event, the real-time model begins to reflect a changing perception of "known costs." Periodically, once per quarter for purposes of the monitoring at issue here, the Company would provide a snapshot of the model. The resulting graphic might look like the next figure, which uses hypothetical numbers.

**Figure V.2: Cost Forecast “Snapshot”**



The rate of reserve erosion becomes the chief focus. The next table shows a way to depict that erosion. One should tend to exercise conservatism at the start, in order to preserve contingency for as long as possible. This approach also recognizes the likelihood that growth becomes more likely at the back end than the front (making the saving of reserves appropriate). Others prefer a straight-line target. The key information lets the reader see the degree to which the control base has been violated and the long-term forecast faces threat.

**Figure V.3: Erosion of Reserve**



Twenty years identifies a theoretically applicable dimension for the AMRP. Such a long time frame, however, weakens the usefulness of the analysis. An alternate time frame in place of or in addition to a 20-year outlook makes sense. For example, cutting off the 20-year charts at 5 years would make the data more credible.

Actual expenditures offer a second and more popular cost indicator, but do not necessarily have value in their own right. This indicator offers more benefit as: (a) a sanity check on the total cost forecast, and (b) a near-term schedule indicator. In the former instance, focus should lie on the degree to which funds expenditure conform to the cost plan. A mismatch can call the forecast into question. The data tells whether resource “burn” occurs at rates demanded by schedule.

The current annual expenditure curve that Peoples Gas reports show should suffice, if accompanied by analysis. Reports should contain planned expenditures, actual expenditures, and forecasted year-end expenditures. To the extent that deviations emerge, they require analysis at an appropriate level.

Unit rates, or productivity, comprise a third key family of cost data. The cost per unit for mains, services, and meters, for example, deserves continuing attention. Such data will offer an early warning signal of growth in the long-term forecast. Peoples Gas should provide summary data and insightful analysis on planned and actual productivity for the current year and for the program to date. Such analysis should include schedule considerations as well. For example, an observed lag in productivity calls for an analysis of impact on schedule and steps to mitigate delays.

Earned value presents another productivity topic of interest. For example, completing 10 units of production “earns” the number of hours corresponding to the budget for that work. Comparing actual hours spent with hours earned provides a good indicator of productivity, or effectiveness. Sophisticated management systems can collect this data at very detailed (low) levels, and aggregate it at increasingly summarized levels to provide management with valuable measures of performance. A project the size of the AMRP calls for the use of sophisticated management tools. Peoples Gas does not employ them now.

Contractor costs comprise a fifth important cost area. Contracting much of the work on a fixed price or unit price basis can lead to the erroneous belief that such costs have less variability, and become the contractor’s problem to manage. Contractor costs can vary in a number of significant ways; *e.g.*, (a) bid prices out of line with assumptions in the project estimate, and (b) contract changes in excess of those anticipated and allowed for in the estimate. Neither of these two exposures has visibility at this time. Change orders and their near- and long-term impacts on total program costs warrant attention. Peoples Gas should provide data and insightful analysis of the following:

- Weighted average ratio of final contract price to initial award value for completed contracts
- Number and dollar amount of change orders requested this year
- Number and dollar amount of change orders approved this year.

#### **b. Program Schedule**

Liberty recommends starting with four schedule categories:

- Bulk production curves
- Long-term schedule projection (retirement curve or similar)
- Resource plans
- Simplified and clarified program quantity tables.

Bulk production curves form the staple for near-term schedule analysis. The reporting of such curves should continue, but not in the detail now offered in AMRP reports. Three annual S-curves (mains, services, and meters) should suffice. Each chart should include plan, actual, and a year-end forecast. Should significant deviations appear, as happened throughout 2014, reporting should contain analysis of them. That analysis should, in a clear way, communicate at least:



- The reasons for significant deviations at a root cause and responsible organization level
- A plan for recovery, including responsible parties, specific commitments regarding resources and dates, and how the Company will manage and enforce those recovery plans
- Any longer-term impacts to the overall program cost forecast and schedule.

From a long-term schedule perspective, the Illinois Commerce Commission should have special interest in the progress towards replacement of all leak-prone pipe, which comprises the fundamental 20-year objective. There exists here a parallel with the treatment of costs described earlier. Reserves or contingencies generally do not find their way into schedule analysis to the same extent as costs. That lack presents problems for Commission oversight. If costs grow materially, schedule impacts become more likely. The relationship between cost and schedule growth should remain an important point of observation, and subject to periodic analysis.

Peoples Gas offered a version of the long-term schedule measure, but it does not bear scrutiny. The Company offers a plot of “AMRP Program Retirement” in the monthly report. Contrary to other schedule indicators, this metric shows the program on target. Management has not updated the chart in two years. Yet its presentation continues in this frozen state. Continued use of a chart showing this information makes sense, provided that it undergoes continuing update.

From a schedule management perspective, the size of the workforce, often reflected in a “force report,” presents a key item of concern. Peoples Gas reports the workforce in terms of “number of monthly full-time equivalent jobs created.” This metric does not bear on work performance. Management does not relate the size of the workforce to the plan in any way. The lack of any correlation precludes judgment about whether the reported figures support schedule, or show consistency with the cost estimate.

Resources have special value as a leading indicator. Deviations can predict schedule breakdowns well in advance. A credible resource plan needs to exist, along with transparency when actual staffing does not support that plan. Ordinarily, a plot of manpower on a planned, actual, and forecasted basis would suffice. Here, however, recent performance suggests problems with the resource categories of contractors, Peoples Gas construction, and Peoples Gas engineering.

A number of the current monthly report’s charts have continuing usefulness. That determination, however, requires greater clarity in their definitions, sourcing, and accuracy. At the present time, the data is contradictory and confusing. Further, the widespread use of “program years” presents a confusing distinction without apparent meaning. Peoples Gas should discontinue it.

### **c. Safety and Quality**

Two other areas, safety and quality, also warrant discussion in the context of Commission monitoring. Public and employee safety should form a part of the monitoring mechanism. Public safety comprises the reason for the program in the first place. Safety also serves as a project management indicator.

Safety usually (but not always) produces consensus more readily among utilities, labor, and regulators. Accordingly, one would expect easier development of a mutually agreeable monitoring program for this subject. The safety information reported in Peoples Gas monthly report, as all

other topics, lacks analysis. The charts and tables do not send apparent or actionable messages. A simple paragraph of analysis could easily replace most of the data with considerable value added.

AMRP reporting does not address public safety. Determining meaningful measures of public safety in the utility business is not easy and this topic is open to discussion with the Company. In any event, this topic deserves monitoring to assure it remains high on the Company's priority list. Liberty recommended cooperative work with the Company (which Implementation Monitoring will provide an avenue for performing) to identify methods for relating work and dollars spent to reduction in public safety risk, and to ensure that leak reduction data gets reported accurately and in ways that relate to meaningful safety metrics.

Meaningful high-level measures of quality are not plentiful. Peoples Gas focuses on the number of non-conformance reports ("NCRs"). This is appropriate, but the data provided currently is inadequate. For Illinois Commerce Commission monitoring purposes, and for analysis purposes, Peoples Gas should modify the data as follows:

- Provide trend information that places the data in context. At present, one cannot judge whether the numbers represent good or bad performance, or improving or deteriorating performance.
- Normalize the data to a work measure (for example, pipe installed in the period, person-hours expended, dollars expended), in order to account for work level variations.
- Discuss non-conformances having a significant safety, cost, or schedule impact.
- Include in the analyses, as applicable, examination of patterns or groupings of non-conformances.

Outside reporting should also address the degree to which gas main and service replacements succeed in meeting risk reduction goals and metrics. Such information should play a central role in verifying that work focuses on the facilities producing greatest risk. Reporting should also consider operating cost changes, as part of ongoing review of the economic costs and benefits that AMRP and related work are producing.

## 5. Recommendations

### **V.1 Peoples Gas should work promptly to identify the AMRP reporting changes that it proposes to implement near term, and tailor them to meet the reporting cycles and content this chapter describes as appropriate for supporting the monitoring needs of the Illinois Commerce Commission.**

The Company's stated intent to revise AMRP reporting substantially makes it efficient to finalize external reporting requirements concurrently with Peoples Gas changes to AMRP reporting. Common timing can make effective use of the very early stages of the two-year monitoring program to verify that reporting improvement has occurred, and to coordinate the data sources and timing of AMRP reports with those that will serve external reporting needs.

The Illinois Commerce Commission has already established a two-year monitoring program intended to examine implementation by Peoples Gas of the recommendations contained in this report. This report makes many recommendations that seek important changes in AMRP (and related program) data collection, reporting, and analysis of cost, schedule, and leak-risk mitigation.

The pendency of the changes recommended means that Peoples Gas will likely continue making changes to report structure and content through much of that two-year period. The dilemma this transition period imposes arises from the fact that the Illinois Commerce Commission and stakeholders have current needs for assessing AMRP status. This report, for example highlights the great uncertainty that now exists with respect to the AMRP's three principal drivers: (a) the total duration likely required for removing all high-risk pipe from the system, (b) how much that elimination will end up costing customers, and (c) the degree to which replacements under current prioritization and planning methods have succeeded and will succeed in reducing the leaks that create substantial safety risks.

Therefore, even though reporting changes will likely continue for some time, working promptly to create at least an interim structure, content, and cycle has substantial importance. Peoples Gas needs immediately to address management reporting changes, to make reporting to the Illinois Commerce Commission and stakeholders meaningful now, rather than far down the road. The AMRP's schedule, cost, and risk mitigation uncertainties require meaningful public reporting to commence as soon as possible.

At the same time, one must recognize that the effectiveness of Program Performance Monitoring will depend significantly on consistency of information used for both internal and external reports, and on reasonably concurrent report timing and data vintage. Thus, the at least interim Illinois Commerce Commission reporting system that needs to begin immediately, must incorporate the ability to grow more robust as Peoples Gas continues to address the management reporting needs that Liberty's report recommends.

To that end, an appendix to this report chapter provides a set of guidelines and reporting templates recommended for use in designing AMRP reports. Peoples Gas should immediately begin development of a Commission reporting structure and content in accord with the guidelines and reporting templates provided. First steps in the two-year monitoring program should include a work session with the Company to ensure full understanding of reporting cycle, structure, and content, and to expedite the creation of a report that the Company can begin providing as soon as possible.

Other factors subject to present uncertainty also have consequence for the design of Program Performance Monitoring. First, Peoples Gas may (or may not) soon have a new owner. Substantive and reporting conditions often accompany regulatory approval of changes of control. Second, stakeholders have expressed significant interest in the AMRP. To the extent that stakeholders raise reporting, monitoring, or transparency issues about the program, it appears logical to consider their views in designing a long-term outside monitoring and reporting program.

In any event, a Program Performance Monitoring program needs to match four key elements:

- Program objectives ultimately deemed appropriate by the Commission
- The specific Company reporting requirements established
- What expectations and requirements apply to the analysis and response to those reports
- The availability of sufficient Commission resources to examine reports and to undertake the dialogue with the Company and the analysis needed to respond to reported information.

## Chapter V Appendix: Program Performance Monitoring Guidelines

The Accelerated Main Replacement Program (“AMRP”) of Peoples Gas has very high public safety priority. The Company must implement the program timely, cost effectively, and in a manner that reduces the safety risks of leak-prone pipe with dispatch. Accordingly, the Illinois Commerce Commission requires continuing information on a regular basis about the costs of the program, the schedule under which the replacements occur, and the risk reduction results that the program seeks designed to achieve. These guidelines and accompanying templates outline the Illinois Commerce Commission’s requirements for periodic reporting by Peoples Gas on the progress and performance of the AMRP.

The recommendations that Liberty has made to improve AMRP management, control, and oversight call for a series of changes addressing AMRP reporting for use by program management and by senior executive and board of director oversight. Making those changes will take time. This document generally describes long-term Illinois Commerce Commission Program Performance Monitoring needs. On an interim basis, Peoples Gas may not prove able to support each reporting item or template provided below. The Company needs to find ways to the meet reporting needs identified in this document as best it can on an interim basis. It must also act expeditiously to establish a sound, accurate, long-term basis for meeting those needs.

### General Direction

The requirements presented below represent today’s program priorities and challenges. They will no doubt change as the project moves forward. Completing the AMRP involves massive effort to address issues and challenges over a long time. Circumstances are likely to prove fluid over so long a period. Surprises prove common on “super-projects” or pogroms like the AMRP. The Illinois Commerce Commission needs flexibility in redefining its needs as time passes and as performance trends emerge. Peoples Gas will need to remain responsive as the Commission’s needs evolve.

The Company manages replacement work in common with work to increase system pressure and to relocate meters from inside to outside locations. The reporting addressed in this document needs to cover the AMRP alone. Peoples Gas must disaggregate information to exclude information addressing these other sources of work and expenditure, which the Qualifying Infrastructure Plant Surcharge now addresses.

This document defines specific data requirements, but does not invite a simple presentation of that data. Reporting must also include:

- Insightful analysis of the data with an eye to identifying issues of performance and opportunities for improvement. Peoples Gas should have or obtain the skills necessary to perform such analyses in support of its AMRP management needs. The required analysis require a level of explanation sufficient to inform the Illinois Commerce Commission of threats to the overall project costs and schedule, the risks and challenges that emerge, and deviations from expected performance.

- To the extent that regular reports identify problems, opportunities, and issues, Peoples Gas must define their impacts, including magnitude of potential resulting cost increases or schedule delays.
- Most importantly, Peoples Gas must discuss options considered or implemented for mitigation of such deviations. Reporting must include action plans identifying responsible people, required deliverables, scheduled due dates, and post-implementation conditions expected. Such plans require enough detail to enable objective assessment of their implementation. Where plans require additional resources or commitments, Peoples Gas must describe and quantify them.
- Progress against corrective action plans shall be reported in subsequent monthly reports.

### The Plan

Before constructing monthly reporting requirements, a program framework with performance requirements must exist. This framework needs to address a plan for the year and for the total AMRP. Peoples Gas must provide, by June 1, 2015 for the initial report and by January 1 for subsequent years, the following information:

<b>AMRP - Initial Required Planning Basis for Monthly Reports</b>				
<b>Category</b>	<b>Measure</b>	<b>Actual thru 12/31 of prior year</b>	<b>Planned this year</b>	<b>Planned for total program</b>
Cost	AMRP expenditures			
Production	Miles of main installed			
	Miles of main retired			
	Services installed			
	Meters installed			
Resources	Program Management - Internal			
(in hours)	Program Management - Contractors			
	Engineering - Internal			
	Engineering - Contractors			
	Construction - Internal			
	Construction - Contractors			
Operational Results	Leaks			
	Leaks per mile of remaining leak-prone pipe			

## Specific Content of Monthly Report

### *Program Summary Level*

At the program summary level, Peoples Gas must report on a template that mirrors the annual plan.

Monthly Reporting at the Program Summary Level							
Category	Measure	Plan for this month	Actual for this month	Planned thru this month	Actual thru this month	Planned for the year	Forecast for the year
Cost	AMRP expenditures						
Production	Miles of main installed						
	Miles of main retired						
	Services installed						
	Meters installed						
Resources	Program Management - Internal						
(in hours)	Program Management - Contractors						
	Engineering - Internal						
	Engineering - Contractors						
	Construction - Internal						
	Construction - Contractors						
Operational Results	Leaks						
	Leaks per mile of remaining leak-prone pipe						

### *Category Level Support Data*

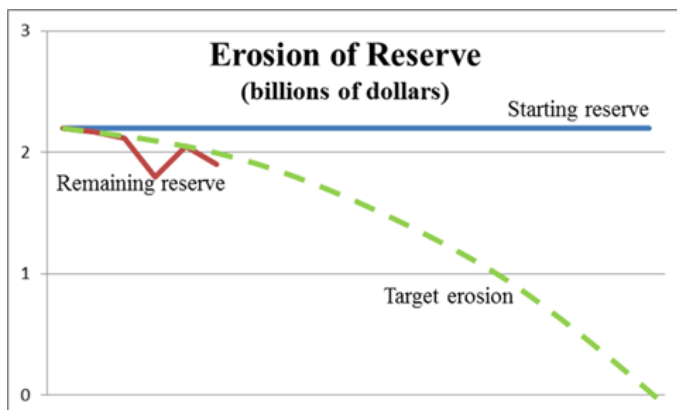
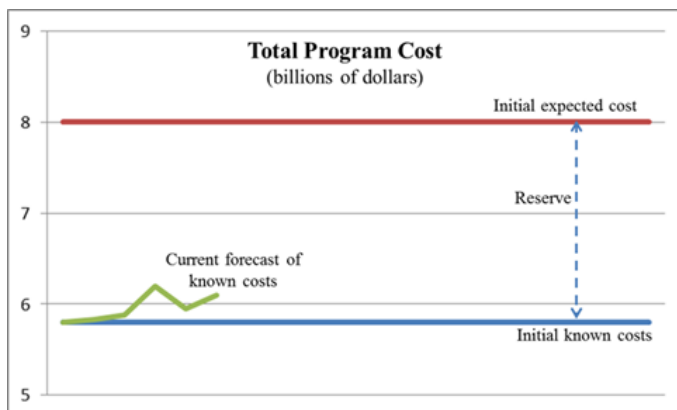
#### 1. Cost - Expenditures

The “AMRP Expenditures” line should be supported by similar data broken down by major cost elements. The AMRP estimating process should identify and structure the applicable cost elements. Liberty would anticipate perhaps 8-15 elements, each of which should have a plan for management of the associated costs. Each plan should be consistent with the magnitude, risk, and controllability of the subject costs. The same six columns from the summary level table should apply, with the total of all cost elements equaling the entries on the summary level table.

#### 2. Cost – AMRP Forecast

Considerable uncertainty surrounds final AMRP cost. With billions of dollars at stake, it becomes essential to track that bottom line cost and to manage it as far as practicable. Liberty has proposed a method, which absent a present alternative from the Company, should apply to regular reports.

The approach begins with a traditionally prepared estimate, except for treating amounts for allowances for unforeseen events or contingencies as minimal. The resulting estimate becomes “known costs” or “the base estimate.” Peoples Gas then needs to apply best efforts to estimate likely growth in the known costs. The assignment of a projected final cost amount should follow rational analysis by Peoples Gas managers, including consideration of growth so far, risk analysis of exposure areas, experience on other large, long-term projects, and other factors and projections by knowledgeable analysts. Such a final estimate will not necessarily produce a high confidence level, but will prove suitable for its intended purpose here. That purpose is to establish of a target against which to track and report future costs.



The difference between known costs and the final projection bears the term “management reserves.” As the program progresses and new costs become identified, known, are identified, the known costs increase and the remaining reserves decrease, as the accompanying chart illustrates. Peoples Gas should monitor the erosion of reserves with the intent of determining when and by how much projected cost should change. Should new known costs become identified at too rapid a pace (causing reserve erosion at too fast a pace), it will eventually become clear that holding to the final forecast has become unwise. At that point, Peoples Gas would need to prepare a new estimate of known costs and a new projection for final costs.

This type of cost reporting approach can tend to break down over long periods. Accordingly, Peoples Gas may wish to present an erosion chart using a shorter timeframe, such as five years. Such an alternative will work. The focus, however, must remain on total program cost, and the Company must present any shorter term conclusions presented in terms of their ultimate effect on total AMRP costs.

### 3. Production

Peoples Gas must support annual summary level production data with S-curves, similar to those in use in its present monthly report. The S-curves should cover the same line items as the summary level report. They should plot the plan for the year, actuals to date, and the forecast for the remainder of the year.

All performance data (cost, production, and resources) requires integration and consistency. For example, to the extent production lags schedule, Peoples Gas might present an accelerated forecast.

In such a case, the Company should also present the corresponding impacts (such as more resources and higher costs) in the other performance categories reported.

#### 4. Resources

S-curves or bar charts will prove appropriate for displaying resource data. Peoples Gas has not been collecting contractor resource data but Liberty understands that it will do so beginning in 2015.

#### 5. Contracts

For all active, or recently completed, contracts, Peoples Gas should provide the following data:

Active or Recently Completed Contracts							
Contractor	Project	% Complete	Initial Contract Value	Initial Budget Amount <sup>1</sup>	Changes Pending	Changes Approved	Contract Forecast
			<sup>1</sup> Including allowances for contract growth				

#### 6. Performance Data

Peoples Gas should provide the following performance-related data:

AMRP Performance Data				
Subject	Unit	Annual Plan	Actual Year To-date	Year-end Forecast
Main installed	hrs/mile			
	\$/mile			
	hrs earned / hrs spent			
Main retired	\$/mile			
Services	hrs/service			
	\$/service			
	hrs earned / hrs spent			
Meters	hrs/meter			
	\$/meter			
	hrs earned / hrs spent			
Key ratios				
Installed to retired miles of main				
Services per installed mile of main				
Meters per service				



## Report Appendix A: Investigation Review Area and Report Chapter Cross-Reference Table

Investigation Review Area	Report Chapter
1. Peoples Gas' understanding of its delivery infrastructure condition	C: The Peoples Gas Distribution System
2. Miles of gas main replaced to date under the program	D. AMRP Definition and Status
3. Miles remaining to be replaced and required annually to meet a 20-year program duration	D. AMRP Definition and Status
4. Gas mains and lengths intended for replacement each year	D. AMRP Definition and Status F: Risk Assessment
5. Determination of schedule likely to be required for program completion	B: Report Summary H: Schedule Planning
6. Likely annual and total program costs	B: Report Summary D. AMRP Definition and Status H: Schedule Planning
7. Development of a method for Commission monitoring of AMRP cost and progress	V: Monitoring
8. Appropriateness of program and project planning and scheduling	E: Plan for Management H: Schedule Planning
9. Program and project cost estimating methods and accuracy	G: Cost Planning K: Cost Estimating
10. Managing City permits and communication; material procurement	M: Procurement and Contracting R: Work Management Q: Field Work Performance T: Government Coordination
11. Program budgeting process and relationship to construction scheduling	N: Executive Oversight Part Two (Chapters E through I)
12. Methods and factors considered in prioritizing replacements	F: Risk Assessment
13. Program and project management methods and practices	E: Plan for Management
14. Facility engineering and design	Q: Field Work Performance
15. Construction standards for new facilities installed	Q: Field Work Performance
16. Construction methods, policies, and practices; right-of-way acquisition	F: Risk Assessment
17. Oversight of work quality and conformance to specifications	Q: Field Work Performance



18. Conformance of work to plans, designs, and construction and materials standards	Q: Field Work Performance
19. Use of subsurface investigation services and geophysical techniques	C: The Peoples Gas Distribution System Q: Field Work Performance S: Safety and Permit Compliance
20. Procedures and practices for addressing unexpected field conditions	C: The Peoples Gas Distribution System Q: Field Work Performance S: Safety and Permit Compliance
21. Methods for gaining access to indoor meters and cutting over services	Q: Field Work Performance U: Customer Coordination
22. Quality and appropriateness of construction materials	Q: Field Work Performance
23. Materials purchasing policies, procedures, and practices	M: Contracting and Procurement
24. Construction contract award policies, procedures, and practices	M: Contracting and Procurement
25. Contractor experience, qualifications, and training	M: Contracting and Procurement Q: Field Work Performance
26. Permit acquisition methods and timing	T: Government Coordination
27. Relationship and communications with other public and business entities	T: Government Coordination U: Customer Coordination
28. Information and schedule sharing and plan coordination with the City of Chicago	T: Government Coordination
29. City of Chicago issues regarding Peoples Gas and its work practices	T: Government Coordination
30. Inspections of active Peoples Gas AMRP construction sites	Q: Field Work Performance
31. Violations and failures to follow government safety standards	S: Safety and Compliance
32. Reasonableness, prudence, and used and useful nature of all aspects of Peoples Gas' AMRP	B: Report Summary
33. Policies and practices for calculating reductions in operation and maintenance costs	F: Risk Assessment



## Report Appendix B: List of Recommendations

### *Part One: Overview*

#### **Chapter C: The Peoples Gas Distribution System**

- C.1 Peoples Gas should include as an element of the neighborhood work planning process an evaluation of the merits of taking an exception to the double decking approach. (*Conclusion C.4*)
- C.2 Peoples Gas should more thoroughly study and report on the causes of extremely high reports of contactor damage incidents. (*Conclusion C.5*)
- C.3 Peoples Gas should undertake measures to verify the operability of external service shutoff valves. (*Conclusion C.5*)
- C.4 Peoples Gas should examine the ability to address low pressure and single-contingency outage risks in the neighborhood program. (*Conclusion C.5*)
- C.5 Peoples Gas should test both services and mains to 100 psig. (*Conclusion C.5*)
- C.6 Analyze and report on the precise nature and numbers of corrosion leaks, and determine whether protected and coated steel mains are experiencing corrosion leaks. (*Conclusion C.6*)

#### **Chapter D: AMRP Definition and Scope**

- D.1 As part of the new planning effort now underway, Peoples Gas should provide a clear and unambiguous description of the AMRP, including quantities for all parameters important to management of the project. (*Conclusions D.1 and D.2*)
- D.2 Peoples Gas should accompany regularly reported performance data with insightful analysis in order to make the data immediately meaningful to management oversight and supportive of timely and responsive improvement and corrective initiatives and activities. (*Conclusions D.1 and D.3*)
- D.3 Peoples Gas should provide a realistic schedule assessment based on an effective program plan. (*Conclusions D.1 and D.6*)
- D.4 Peoples Gas should prepare a soundly derived, detailed resource plan and provide for full coordination between the annual budget and resulting resource requirements. (*Conclusions D.1 and D.7*)
- D.5 In light of apparent decreases in productivity, Peoples Gas should promptly complete an analysis of productivity associated with the installation of meters. (*Conclusions D.1 and D.8*)
- D.6 Peoples Gas should promptly complete a new program cost estimate consistent with good estimating practices. (*Conclusions D.1 and D.9*)



## ***Part Two: AMRP Planning***

### **Chapter E: Plan for Management**

- E.1 Peoples Gas should complete a full replacement of the plan for management (the Project Execution Plan) addressing all key elements of AMRP management and control. (*Conclusion E.1*)
- E.2 Current developmental plans for a new Project Execution Plan should specifically address prior failures and how they will be avoided in the new plan. (*Conclusion E.1*)
- E.3 Peoples Gas should prepare a long-term AMRP management resource plan that specifically addresses: (a) requisite skills needed both on an immediate and on a longer term basis, (b) current gaps in internal capabilities, (c) the optimum balance of owner versus contractor personnel, (d) acquisition and development of resources, and (e) succession plans. (*Conclusions E.2, E.3, and E.4*)
- E.4 Peoples Gas should move toward a project organization that makes significantly more use of dedicated resources under a strong project manager approach. (*Conclusion E.5*)
- E.5 Peoples Gas should prepare a specification for a new program management function, correcting the weaknesses in the current process. (*Conclusion E.6*)
- E.6 Peoples Gas should assign a project manager to most, if not all, AMRP neighborhood projects. (*Conclusion E.7*)

### **Chapter F: Risk Assessment**

- F.1 Peoples Gas should develop, staff, and implement a data quality control program. (*Conclusion F.3*)
- F.2 Peoples Gas should develop a database of soils data already collected, and populate it further with soils data taken at new excavations. (*Conclusions F.4*)
- F.3 Peoples Gas should conduct a structured study of alternative criteria and weightings for the Main Ranking Index and for the neighborhood approach. (*Conclusions F.5 and F.6*)
- F.4 Should Peoples Gas not change the current criteria and weightings, the Company should develop additional measures to reduce leak rates further. (*Conclusions F.5 and F.6*)
- F.5 Peoples Gas should determine on system, segment, and neighborhood bases the level of acceptable risk and metrics that will support appropriate adjustments in replacement rates. (*Conclusion F.7*)
- F.6 Peoples Gas should develop a cost model that addresses O&M costs associated with AMRP and related work. (*Conclusion F.7*)

### **Chapter G: Cost Planning**

- G.1 Peoples Gas should develop a new Cost Plan Model that includes comprehensive measurement bases and critical assumptions regarding scope, quantities, productivity, labor costs, unit costs, and regulatory requirements; a reserve should be included as part of the overall program costs. (*Conclusions G.1, G.2, G.3, G.4, and G.5*)
- G.2 Peoples Gas should establish a Cost Trend Program to monitor potential, major cost-affecting items. (*Conclusion G.3*)



## **Chapter H: Schedule Planning**

- H.1 Peoples Gas should develop a Scheduling Master Plan. (*Conclusion H.1*)
- H.2 Peoples Gas should develop a complete project schedule for every new project, and it should address all aspects of the work required, from engineering to construction and through completion. (*Conclusion H.2*)
- H.3 Peoples Gas should resource-load schedules to address all physical work resources (including internal workforce and contractors) and construction inspectors. (*Conclusion H.5*)
- H.4 Peoples Gas should regularly perform schedule variance analyses to identify recurring or systemic issues, and plan corrective actions. (*Conclusion H.6*)
- H.5 Peoples Gas should complete promptly its efforts to ensure that construction schedules become quantity-based for the internal workforce and for contractors. (*Conclusion H.3*)

## **Chapter I: Resource Planning**

- I.1 Peoples Gas should develop a long-term resource staffing plan that reflects the numbers, skills, and experience needs of all key positions. (*Conclusions I.1, I.2, I.3, I.4, and I.6*)
- I.2 Peoples Gas should develop the in-house capability to replace gas mains and install services on a larger and more long-term basis. (*Conclusion I.5*)
- I.3 Peoples Gas should act immediately to address the need for sufficient internal resources to perform back end AMRP work as planned and scheduled. (*Conclusion I.2*)
- I.4 Peoples Gas should bring enhanced productivity measurement and management to resource planning. (*Conclusion I.7*)
- I.5 Peoples Gas should more closely monitor contractor resources and production. (*Conclusion I.2*)
- I.6 Peoples Gas should establish a centralized resource planning group or function. (*Conclusions I.1, I.2, I.3, I.5, and I.6*)
- I.7 Peoples Gas should evaluate regularly the performance (*e.g.*, wage rates, quality, productivity, expertise, safety, dependability) of the internal and external workforce. (*Conclusion I.2*)

## ***Part Three: AMRP Management and Control***

## **Chapter J: Scope Control**

- J.1 AMRP management should promptly design and implement a two-pronged scope control process: (a) at the program level, and (b) at the individual project level. (*Conclusion J.1*)

## **Chapter K: Cost Estimating**

- K.1 Peoples Gas should establish a cost estimating capability by formulating a clearly communicated cost estimating philosophy, formalizing a cost estimating process, preparing procedures, and developing effective tools. (*Conclusions K.1 and K. 3*)



- K.2 Peoples Gas should maintain and keep updated a set of historical databases that address cost estimating variables. (*Conclusion K.2*)
- K.3 Peoples Gas should perform project cost estimate reconciliations to understand major cost deviations, analyze performance and document lessons learned. (*Conclusion K.4*)
- K.4 Peoples Gas should expand the development of cost estimates at the individual project level and at the program level. (*Conclusion K.5*)
- K.5 Peoples Gas should establish a centralized cost estimating organization to maintain and sharpen the cost estimating skills. (*Conclusions K.2 and K.3*)

## **Chapter L: Cost Management**

- L.1 Peoples Gas should implement a holistic cost management program. (*Conclusions L.1, L.2, and L.4*)
- L.2 Peoples Gas should establish a structured, well defined approach to managing AMRP costs at three levels: the long-term total program outlook, the individual project level, and the annual budget view. (*Conclusion L.2*)
- L.3 Peoples Gas should define appropriate roles for cost management professionals, including all activities, responsibilities, and accountabilities important to holistic cost management. (*Conclusion L.3*)
- L.4 Peoples Gas should establish a cost support organization that: (a) resides organizationally at a level and in a place consistent with treating cost management as a high program priority, (b) serves the cost management needs of all levels of management, (c) develops a force of skilled cost professionals and assures those skills are continuously improved, and (d) has overall accountability for the development and implementation of the cost management program. (*Conclusion L.3*)
- L.5 Peoples Gas should provide training for managers, supervisors and cost support personnel in cost management techniques consistent with the holistic approach. (*Conclusion L.5*)
- L.6 Peoples Gas should continue aggressively to pursue the recommendations made by Liberty in discussions leading to the interim report. (*All conclusions from this chapter*)

## **Chapter M: Procurement and Contracting**

- M.1 Peoples Gas should develop a formal strategy to ensure that the Company gets above-average terms and below-average pricing in view of the long-term opportunities afforded by the AMRP. (*Conclusion M.2*)
- M.2 Peoples Gas should regularly include in program monthly reports information showing procurement fulfillment and past due rates. (*Conclusion M.3*)
- M.3 Peoples Gas should develop a formal strategy to ensure that the Company gets optimum terms and pricing in view of the long-term opportunities afforded to contractors by the AMRP. (*Conclusion M.4*)
- M.4 Peoples Gas should determine those contract administration tasks that it considers required, and assure that the Project Management Office executes those tasks. (*Conclusion M.2*)
- M.5 Peoples Gas should apply a program of enhanced management oversight to the contract change process. (*Conclusion M.3*)



- M.6 The Project Management Office should implement enhanced analysis of its results in managing contract changes. (*Conclusion M.4*)
- M.7 The Supply Chain and Project Management organizations should require contractors to provide key data that supports their plans and bids. (*Conclusion M.5*)
- M.8 The Project Management Office should link the results of its contractor evaluation program to future bid evaluations and awards. (*Conclusion M.6*)

#### **Chapter N: Executive Oversight**

- N.1 Peoples Gas should clearly define and document the AMRP governance roles of the Executive Steering Committee with mission statements, charters, and roles and responsibilities for project oversight, monitoring and decision authority. (*Conclusion N.4*)
- N.2 Peoples Gas should promptly execute its current plans to provide for more regular and effective oversight of AMRP and for follow-through and corrective actions to address performance shortfalls. (*Conclusion N.5*)
- N.3 Peoples Gas should substantially enhance the completeness and accuracy of AMRP performance information provided to the boards of directors, and ensure its consistency with information used by AMRP program management and provided to the small executive group with designated responsibility for program oversight. (*Conclusion N.6*)
- N.4 Peoples Gas should expand top-level AMRP performance metrics and reports to include more actionable information, and to compare actual performance with plans and budgets meaningfully. (*Conclusion N.7*)
- N.5 Peoples Gas should upgrade AMRP performance metrics to include annual or cumulative progress versus the long-term (20-year) plan goals and metrics for the executive oversight group and the boards. (*Conclusion N.8*)
- N.6 Peoples Gas should employ outside assistance in designing and implementing the initiatives it committed to undertaking to improve AMRP management, control, and oversight. (*Supported generally by conclusions throughout this report*)

#### **Chapter O: Reports and Analysis**

- O.1 The AMRP Project Management Office should overhaul its approach to reporting, with emphasis on defining and meeting the needs of managers and staff. (*Conclusion O.1 and O.5*)
- O.2 Management should establish a framework for performance improvement based on analysis of project performance and corrective actions. (*Conclusion O.2*)
- O.3 In the course of its current improvement initiatives, Peoples Gas should redefine and reestablish its standards for program performance. (*Conclusions O.3*)
- O.4 The Project Management Office should establish a culture and a regular, defined, comprehensive program that provides insightful analysis of program performance, and should acquire the capability to perform such analyses. (*Conclusion O.4*)
- O.5 Peoples Gas should expand the role of its project controls professionals to allow for more analysis of project progress and performance and, in turn, support of management by facilitating corrective action. (*Conclusion O.7*)



## **Chapter P: Auditing of AMRP Costs**

- P.1 Peoples Gas should conduct a comprehensive assessment of AMRP risks associated with potential mismatches between work performed and work charged, and develop an ongoing program of annual testing designed to mitigate the risks identified. (*Conclusion P.1*)
- P.2 Peoples Gas should provide for dedicated, executive level sponsorship of the three-year materials and equipment control initiatives program and provide a regular method of reporting progress to the Illinois Commerce Commission. (*Conclusion P.4*)
- P.3 Peoples Gas should promptly: (a) correct the potential gap that exists with respect to ensuring the accuracy of material and equipment costs charged to the AMRP, (b) develop a method for reliably and accurately determining independently the magnitude of any error in AMRP material and equipment costs being included in rate recovery, and (c) devise and implement a similarly independent testing program to verify that no material risk exists with respect to AMRP costs subject to rate recovery. (*Conclusion P.5*)

## ***Part Four: Managing Work in the Field***

### **Chapter Q: Field Work Performance**

- Q.1 Peoples Gas should address a number of construction standards' needs, and should enhance training, documentation, and auditing in a number of areas related to construction standards. (*Conclusion Q.2*)
- Q.2 Peoples Gas should adopt measures to ensure consistent use of construction inspection checklists, develop a structured program for analyzing the information they produce to identify and respond to field performance issues disclosed, and clearly empower inspectors to halt unsafe work. (*Conclusion Q.3*)
- Q.3 Peoples Gas needs promptly to conduct short-term and long-term analyses of its requirements for skilled and experienced field resources, develop incentives for moving personnel into new positions and incenting senior workers to remain, and ensure that training and development efforts anticipate (and not merely react to) vacancies. (*Conclusion Q.5*)
- Q.4 Identify and pursue means to increase the stability in and the numbers of field supervision and inspection personnel. (*Conclusion Q.6*)
- Q.5 Clarify responsibilities for key field roles and institute training programs to support them more fully. (*Conclusions Q.7 and Q.8*)
- Q.6 Peoples Gas should examine the benefits of equipping technicians with sub-meter accurate GPS devices in areas that have line of sight to satellites. (*Conclusion Q.10*)

### **Chapter R: Work Management**

- R.1 Peoples Gas should establish a formal continuous improvement program under the Impact Team to promote a culture of and an emphasis on seeking innovations to improve efficiency in the installation of mains, services, and meters. (*Conclusion R.2*)





- R.2 Peoples Gas should assign a project control engineer or cost analyst to each of the three Shops to handle the analysis of all AMRP construction work performed by the internal workforce and contractors. (*Conclusion R.3*)
- R.3 Peoples Gas should assign a single manager to coordinate AMRP-level permitting improvement initiatives and to monitor and measure permitting for the duration of the program. (*Conclusion R.4*)

### **Chapter S: Safety and Compliance**

- S.1 Peoples Gas should invigorate its commitment to safety and permit compliance through designation of an executive level “champion,” and institute a comprehensive communications program, set aggressive goals and performance targets, perform regular measurement, perform root cause analysis, and develop responsive action plans. (*Conclusion S.1*)
- S.2 Peoples Gas should more closely examine the root causes and develop a responsive action plan to improve employee accident rates. (*Conclusion S.2*)

### **Chapter T: Government Coordination**

- T.1 Peoples Gas needs to continue to focus on improving communications and relationships with the City and with its Department of Transportation, but must recognize that it will take improved permitting and work performance to create and sustain relationships at the level needed to optimize AMRP performance. (*Conclusion T.2*)
- T.2 Peoples Gas should expand the scope of AMRP project schedules to incorporate permitting requirements. (*Conclusion T.3*)
- T.3 Peoples Gas should develop a database of permit applications. (*Conclusion T.3*)
- T.4 Peoples Gas should work with the Chicago Department of Transportation to determine which existing and potential reports from the Department’s system are available and which could be provided to Peoples Gas. (*Conclusion T.4*)
- T.5 Peoples Gas should improve the database of rail crossing permits. (*Conclusion T.5*)
- T.6 Peoples Gas should improve its database of citations. (*Conclusion T.6*)

### **Chapter U: Customer Coordination**

- U.1 Peoples Gas should alter the AMRP Communications Plan. (*Conclusion U.1*)
- U.2 Peoples Gas should standardize the process to set AMRP customer appointments. (*Conclusions U.2 and U.5*)
- U.3 Peoples Gas should ensure that the Customer Information System fully supports AMRP communications processes. (*Conclusion U.4*)
- U.4 Peoples Gas should adequately resource the AMRP Complaints Handling Group, and should monitor complaint resolution performance and the root causes of customer complaints, for the purpose of identifying improvement opportunities. (*Conclusion U.6*)
- U.5 Peoples Gas should measure on a regular basis: (a) customer satisfaction with AMRP, and (b) the effectiveness of AMRP Communications and Customer Service. (*Conclusion U.7*)



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## *Part Five: Monitoring*

### **Chapter V: Monitoring**

- V.1 Peoples Gas should work promptly to identify the AMRP reporting changes that it proposes to implement near term, and tailor them to meet the reporting cycles and content this chapter describes as appropriate for supporting the monitoring needs of the Illinois Commerce Commission.

